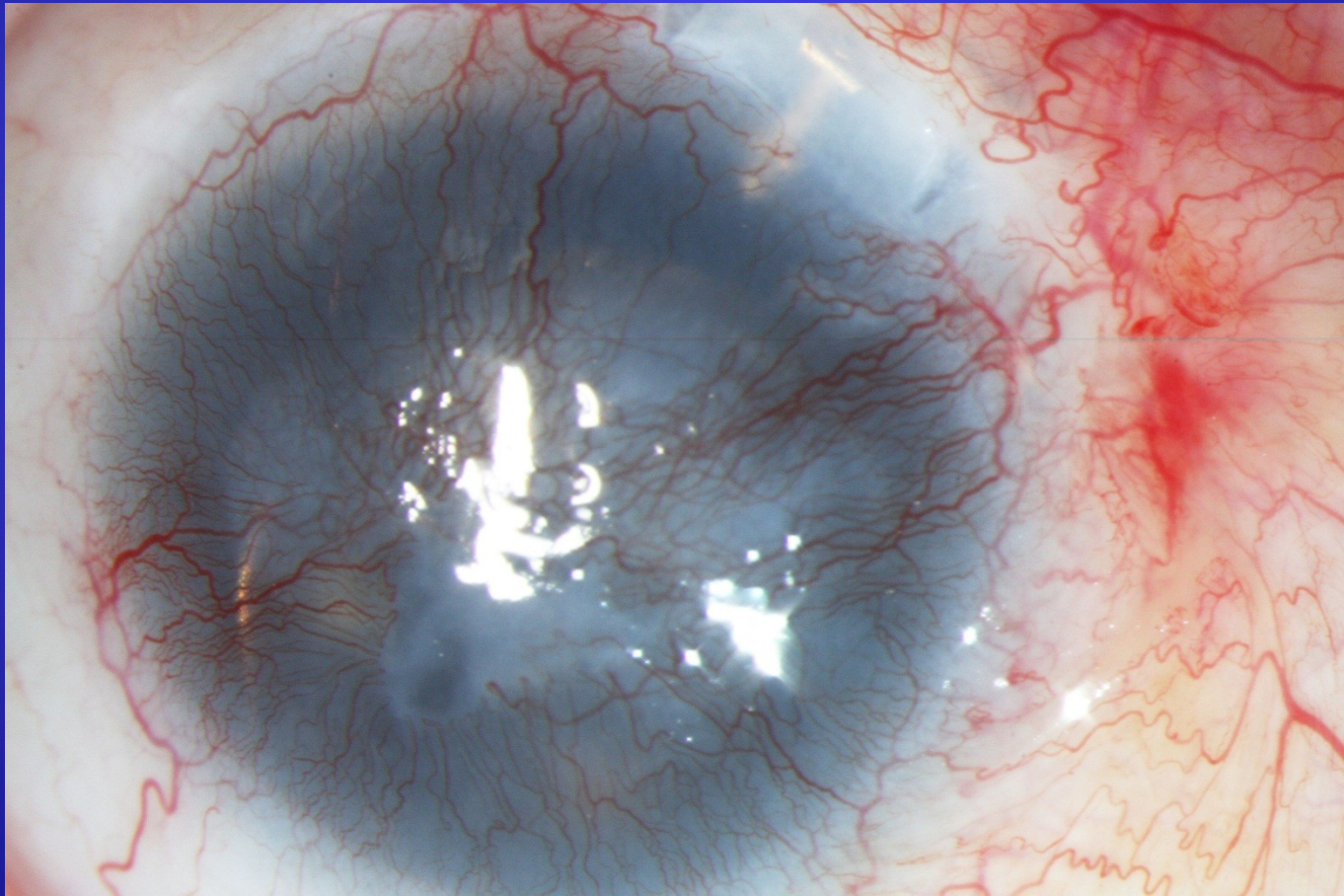


Cornea

Eva Vlková

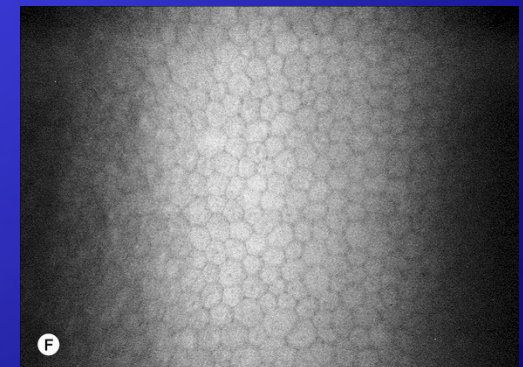
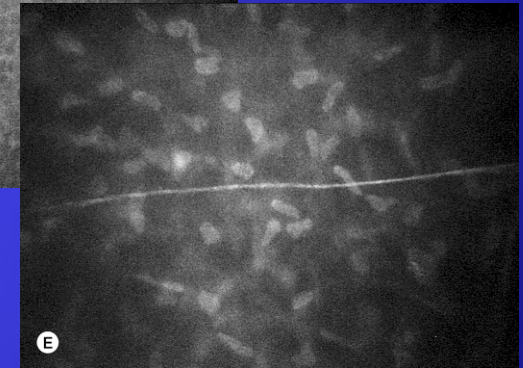
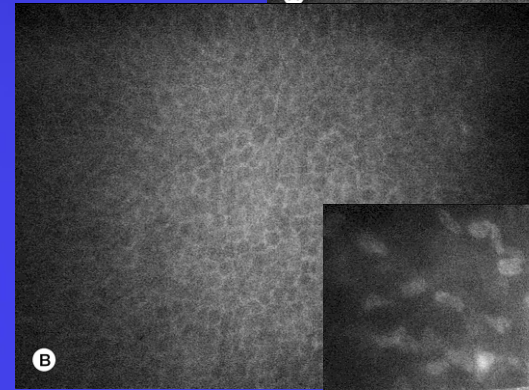
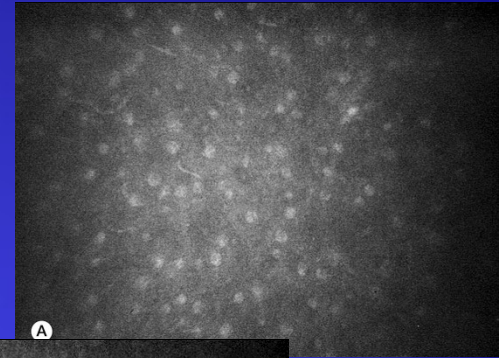


Anatomy of cornea

- Transparent optical part of the eyeball - impermeable barrier
- Refractive medium (43 D)
- Diameter 11.5 mm x 12.6 mm
- Central thickness of 560 micron
peripheral thickness of 60 - 1000 μ m
endothelial cell density (2600 / mm²)
water content 76-80%

Anatomy of cornea

- Epithelium – squamous, nonkeratinized (4-6 layers), ability of regeneration (A)
- Bowman's membrane - (8-12 μ m) - acellular, separates the epithelium and stroma, without regeneration (B)
- Stroma - (90% of thickness) 300-500 lamellae of collagen fibrils in the extracellular matrix (keratinocytes) (E)
- Descemet membrane - product of endothelial cells
- Endothelium - one layer of hexagonal cells (5000-2000 cells / mm²), decreases with age (F)



Anatomy of cornea

- Innervation – n. nasociliaris (nn. ciliares longi) V. cranial nerve
- Immunology - privileged status is due to avascularity, the lack of lymphatic drainage, a small proportion of antigen presenting cells and the secretion of immunosuppressive cytokines (apoptosis of lymphocytes)
- The phenomenon ACAID (anterior chamber associated immune deviation)

Function of cornea

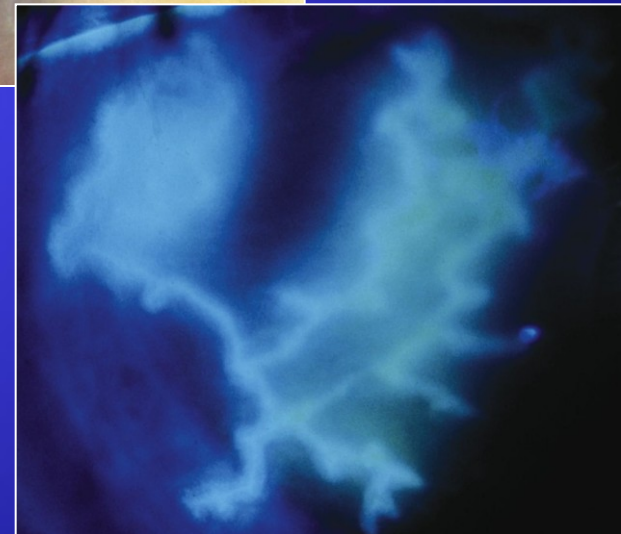
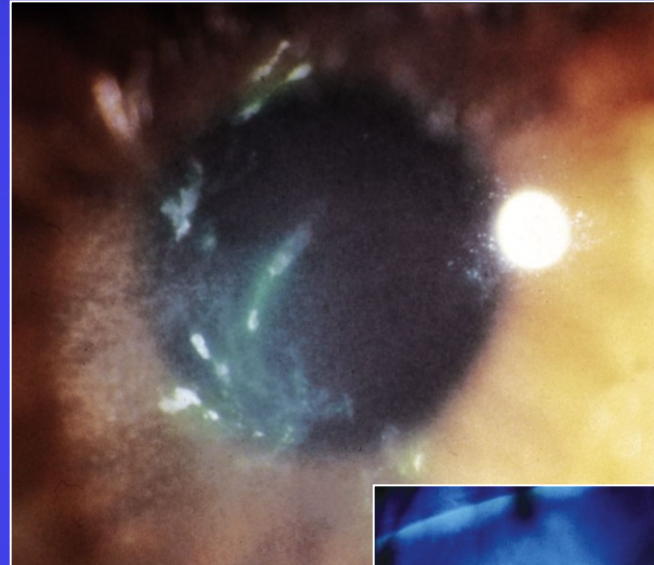
- Most refractive tissue (43D)
- Transparency is defined by the arrangement of fibrils
- Endothelial pump (ability of endothelium actively suck water- Na / K ATP pump)
- Decrease in endothelial cells below 500 / mm² leads to irreversible changes

Basic examination methods

1. Anamnesis
2. Slit lamp biomicroscopy
3. Visual acuity
4. Laboratory test (microbiology, cytology, serology, PCR)

Special examination methods

- BUT
- Schirmer test
- Staining
 - Fluorescein
 - Bengal rose

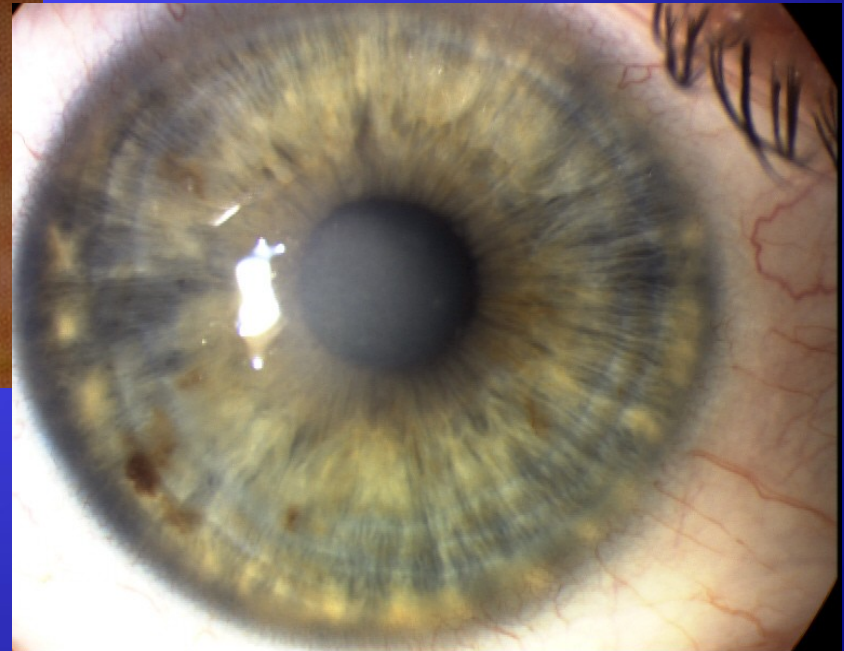


Special examination methods

1. Pachymetry (ultrasound, optic)

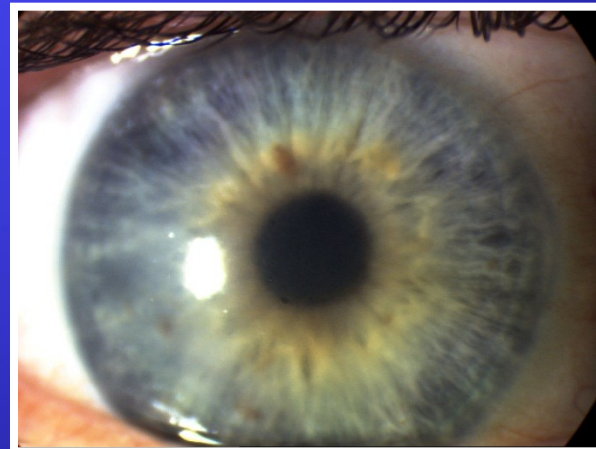
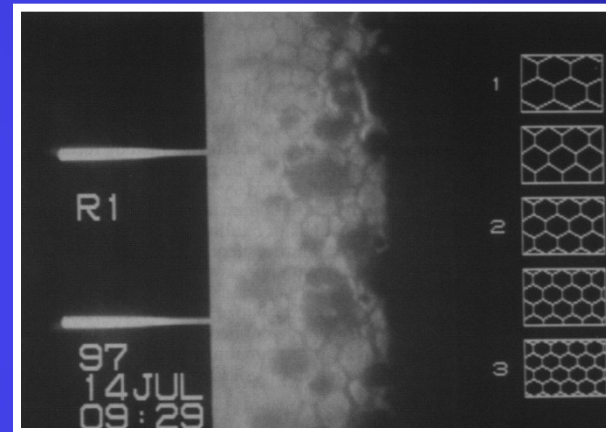
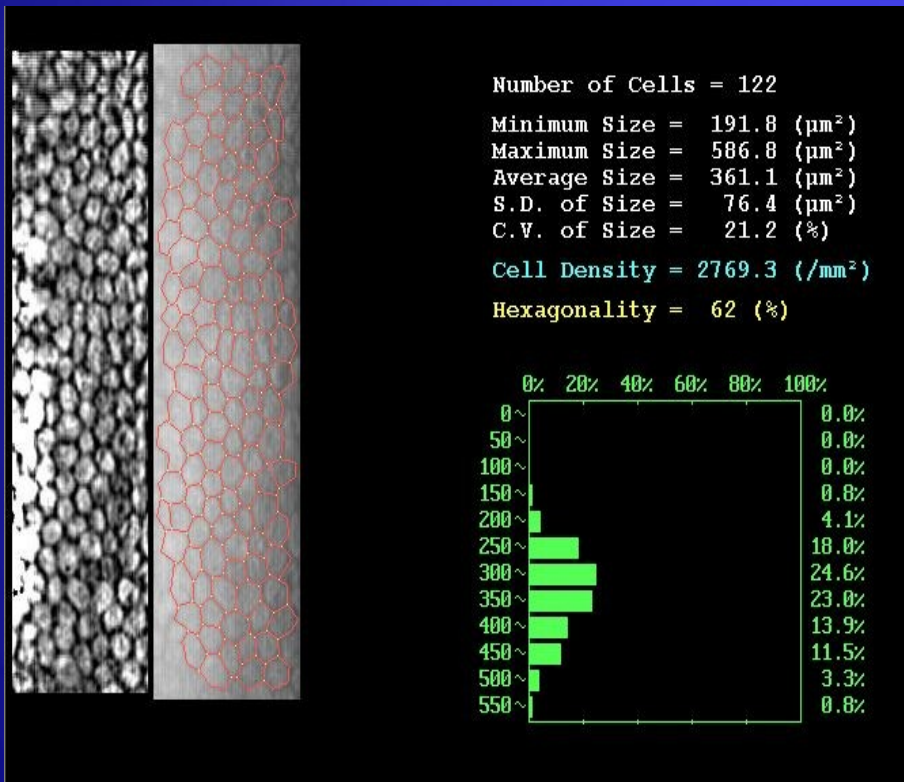
2. Esteziometry (cotton buds,
estesimetr)

Photodocumentation



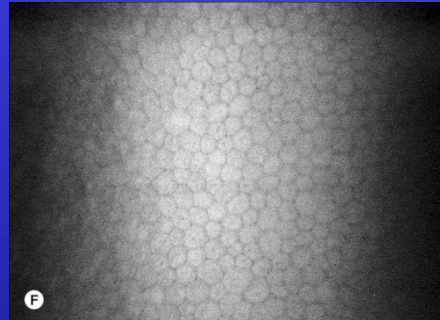
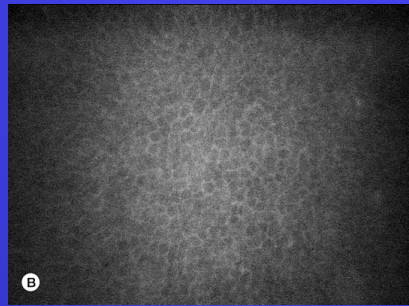
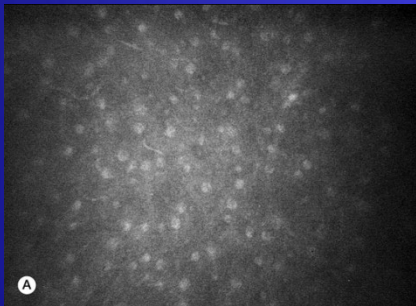
Specular microscopy

- Dytrophia corneae endotheliasis Fuchs

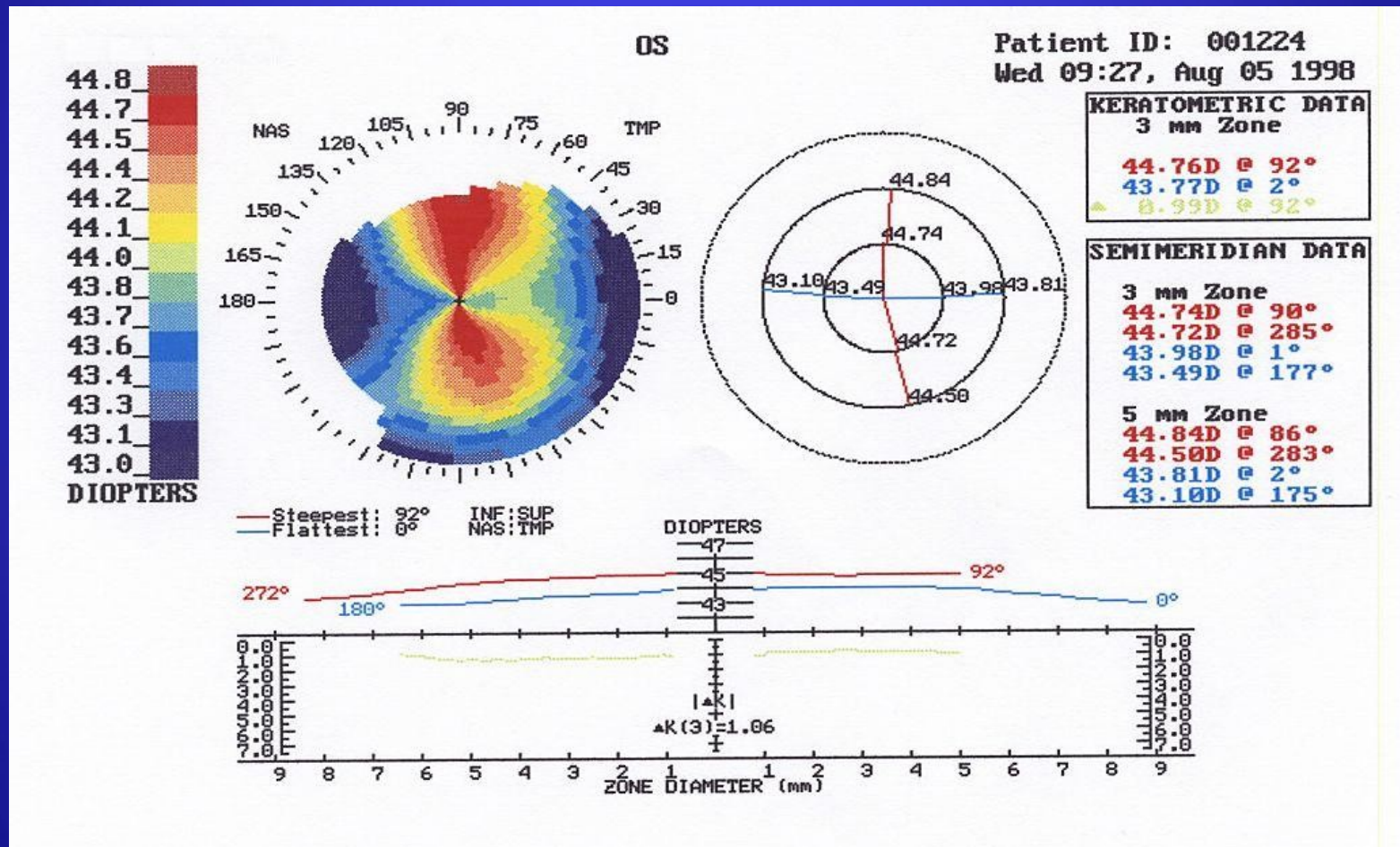


Confocal microscopy

- in vivo „histology“ examination
- Non invasive, non contact



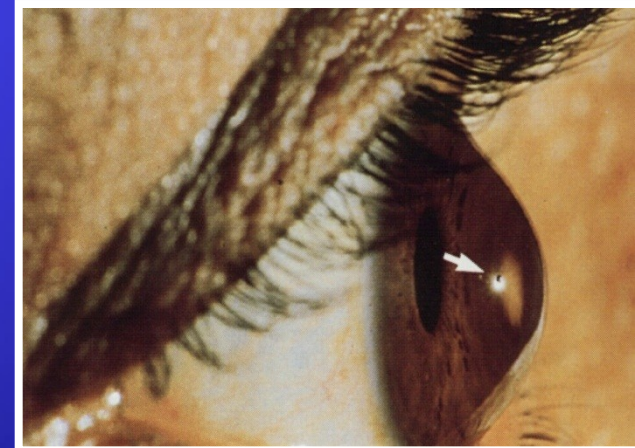
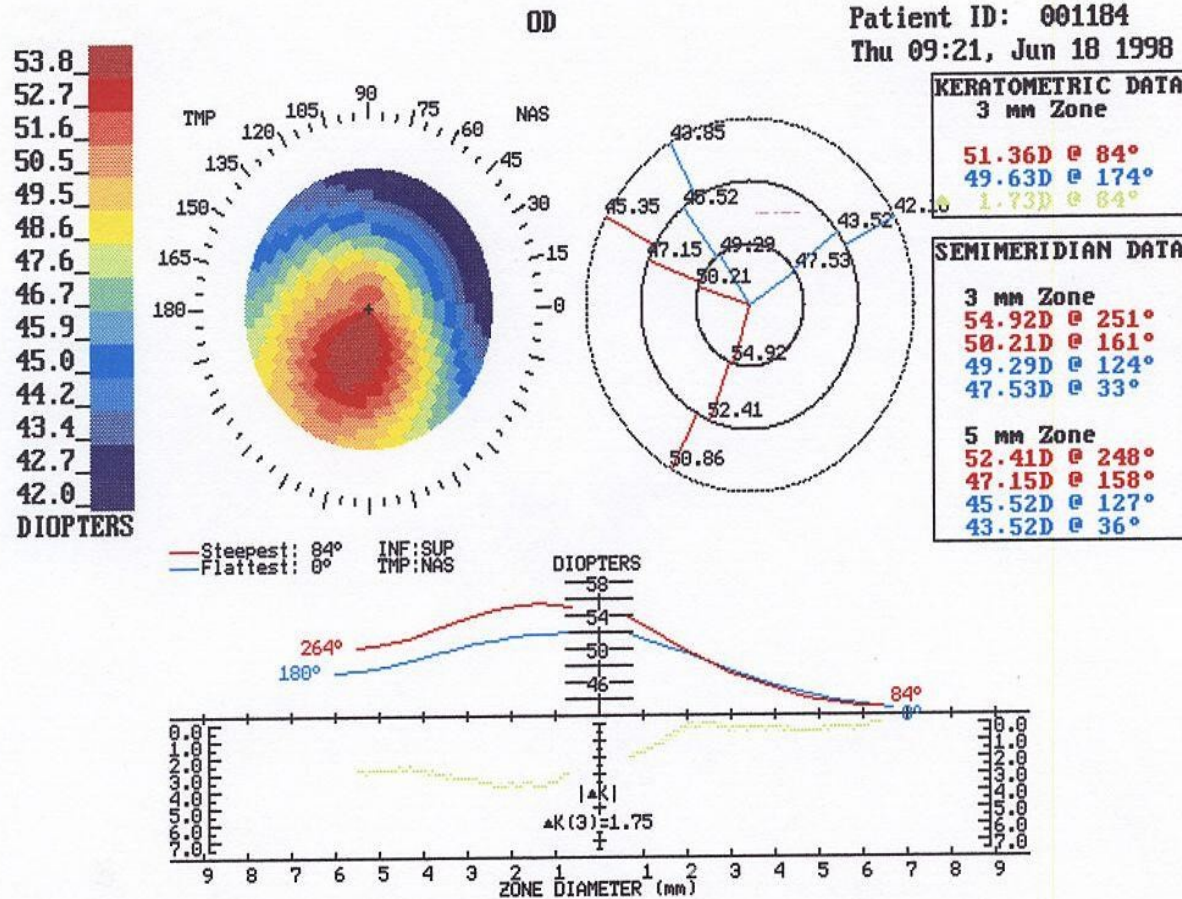
Corneal topography



Physiological astigmatism

Corneal topography – keratoconus

(flat curvature = blue, steep = red)

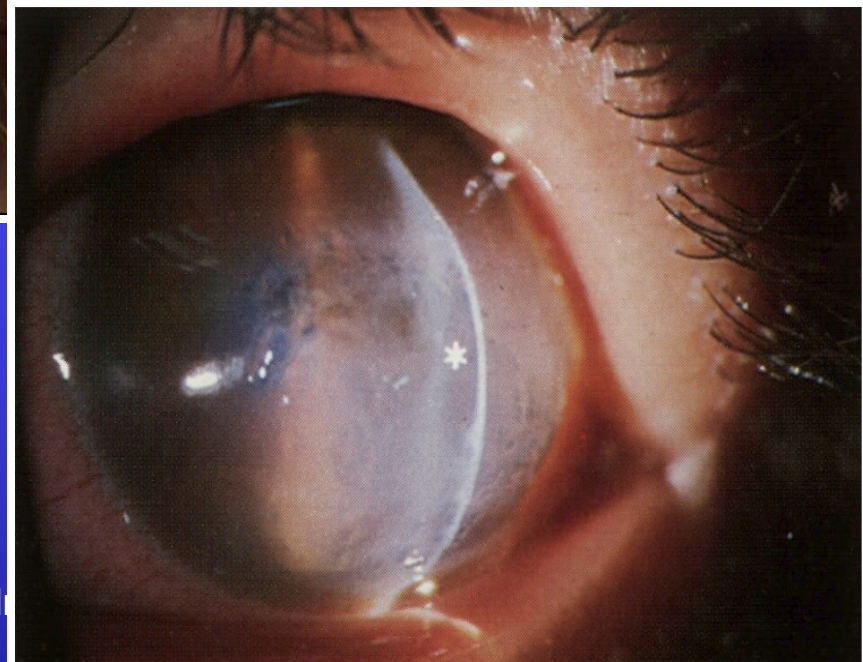
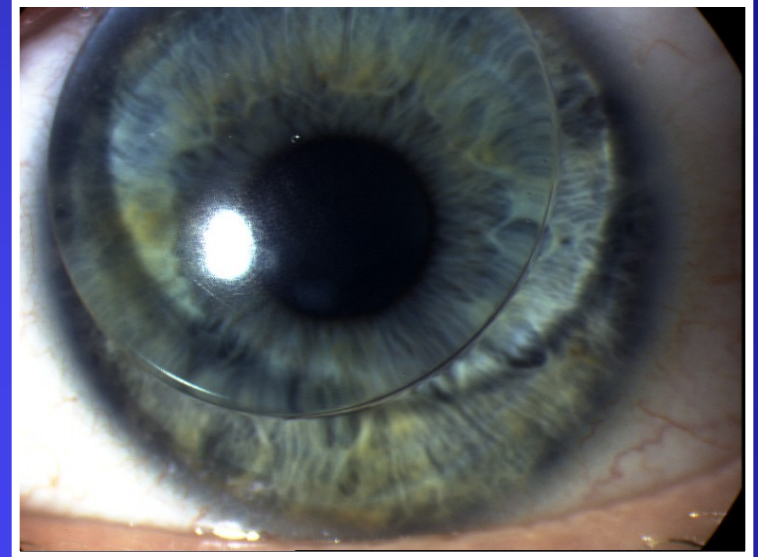
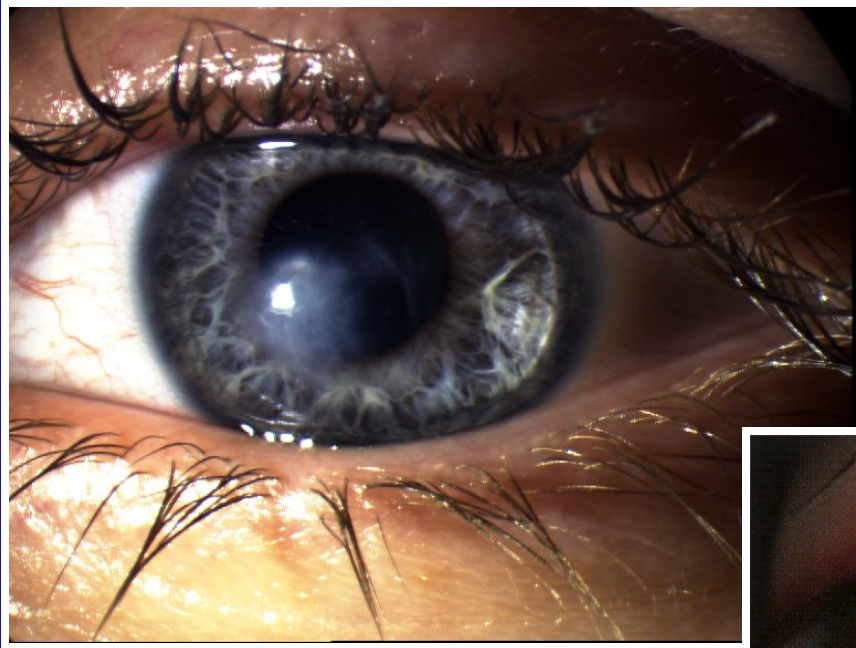


Corneal ectasias

- **Keratoconus** – progressive, the cornea assume the cone shape
Treatment: rigid contact lenses, CLX, intrastromal ring, lamellar and penetrating keratoplasty
- **Keratoglobus** - the thinning of entire cornea
- **Pellucid marginal degeneration** – thinning in the lower periphery of the cornea, perforation sometimes occurs

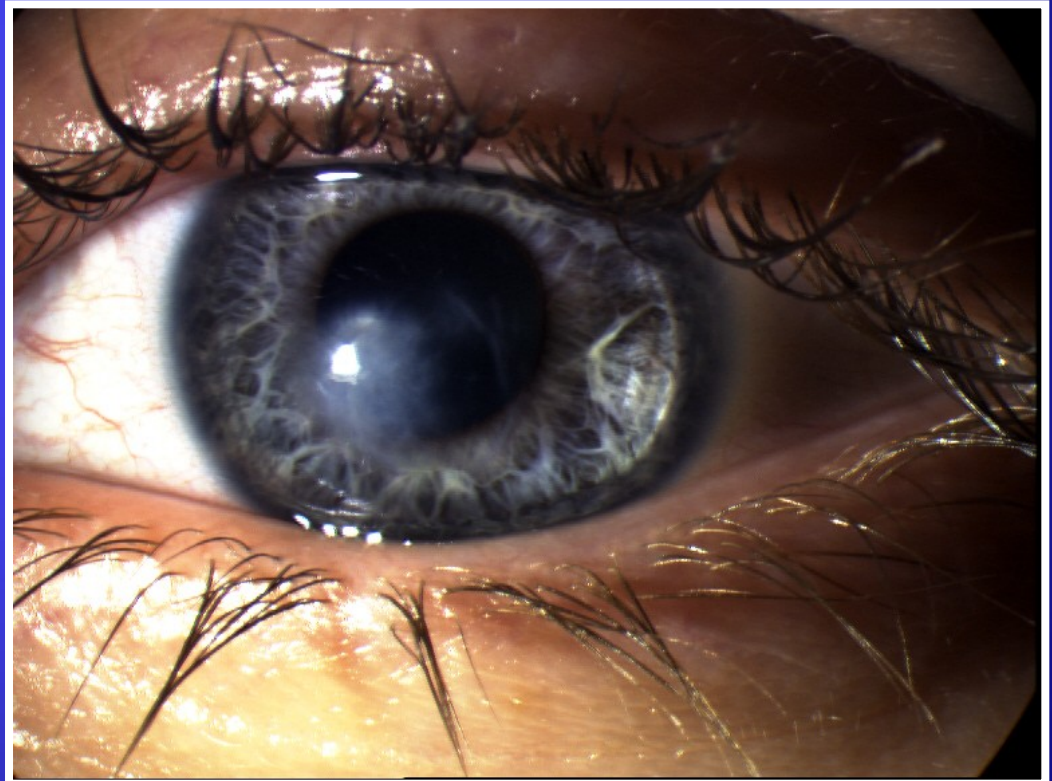


Keratoconus acutus et subacutus



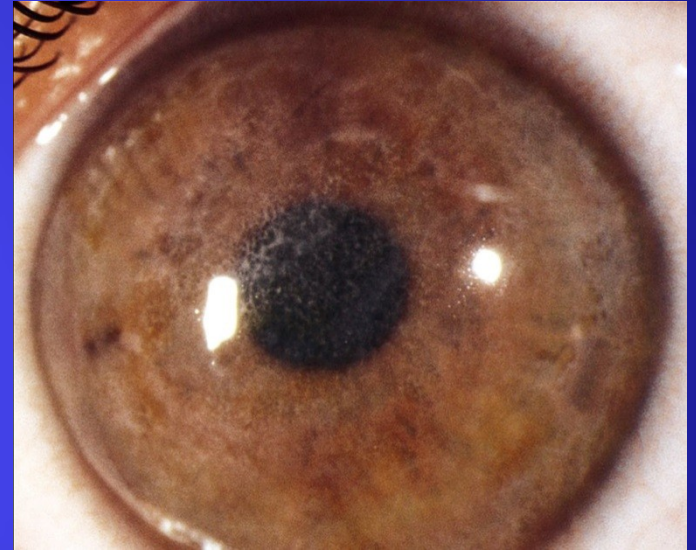
Corneal dystrophies

- Progressive, bilateral, non inflammatory, opacifying
- Anterior
- Stromal
- Posterior

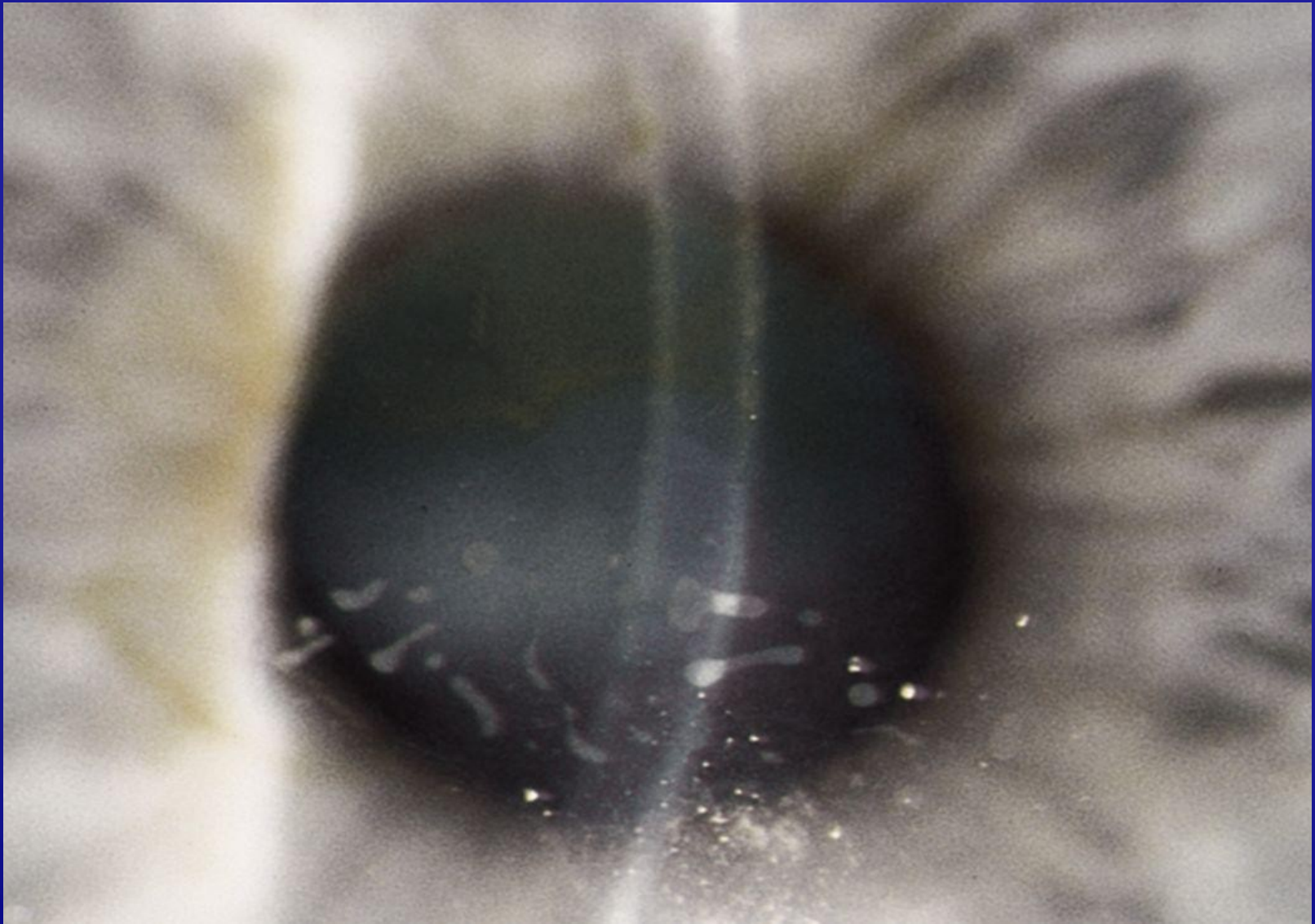


Anterior corneal dystrophies

- Cogan dystrophy - epithelial basement membrane
- Messman dystrophy – epithelium
- Reisoa – Bücklersova – Bowman layer dystrophy

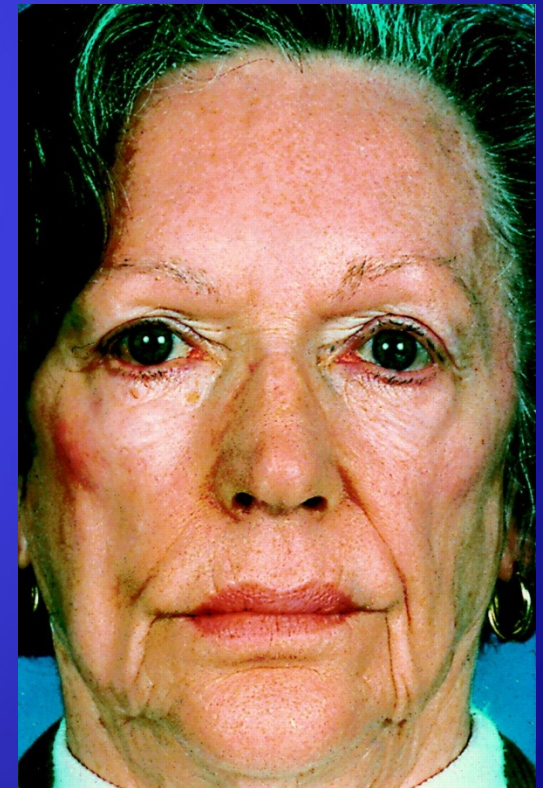


Cogan dystrophy (map dot finger print)

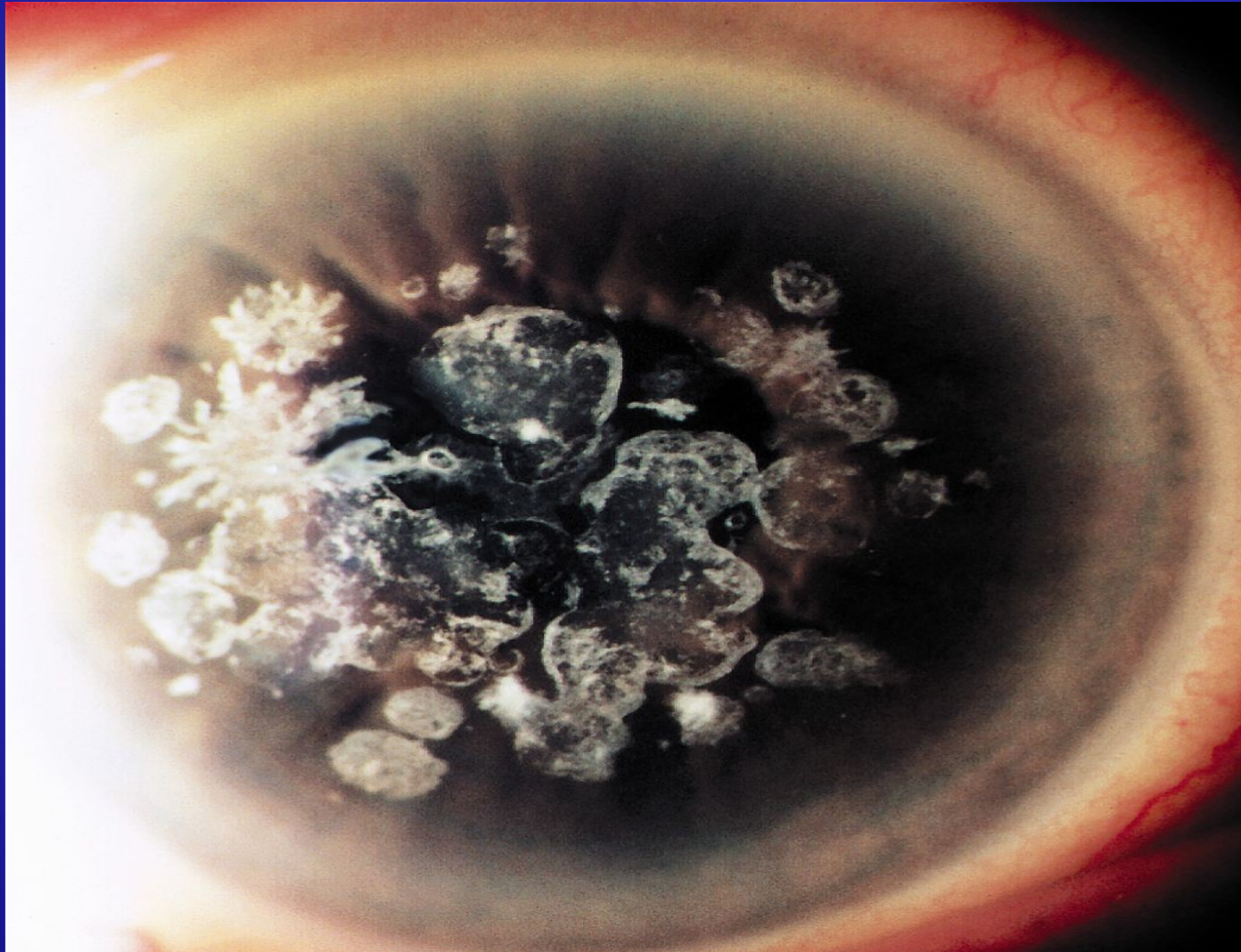


Stromal dystrophies

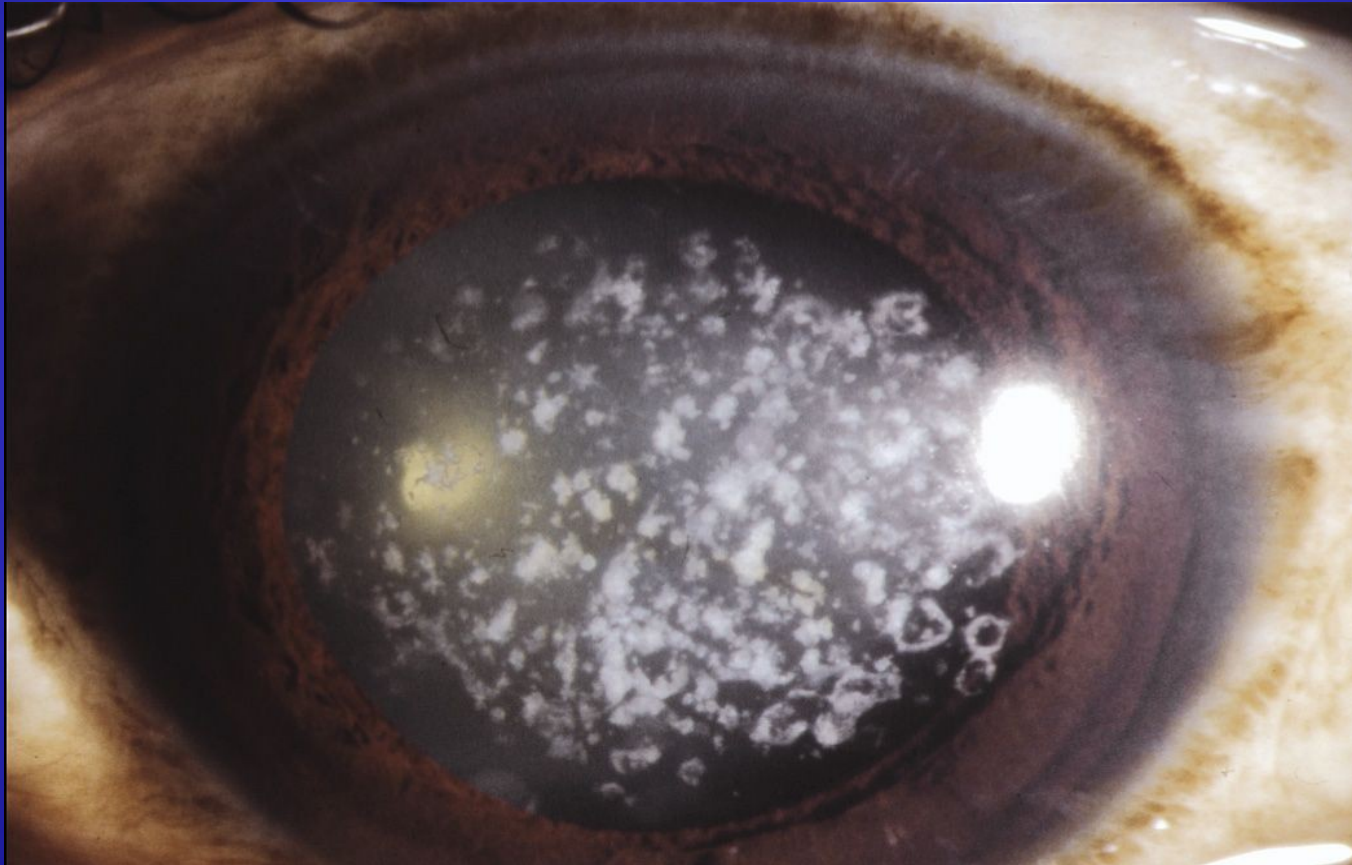
- Early onset, impairment of vision
- T: perforating keratoplasty
- Granular
- Macular (the most severe)
- Lattice (systemic asoc. – sek. Amyloidosis)



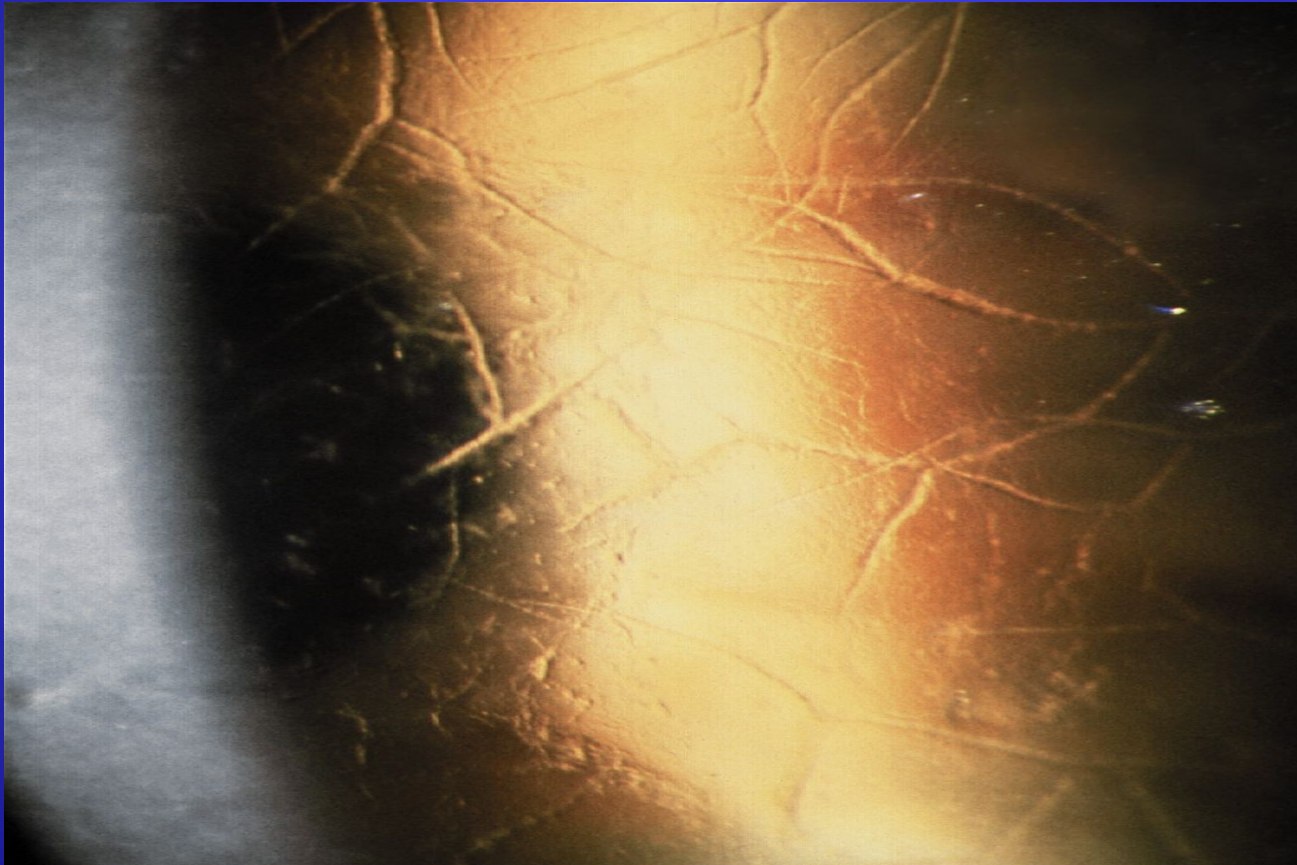
Crystalline dystrophy



Granul dystrophy

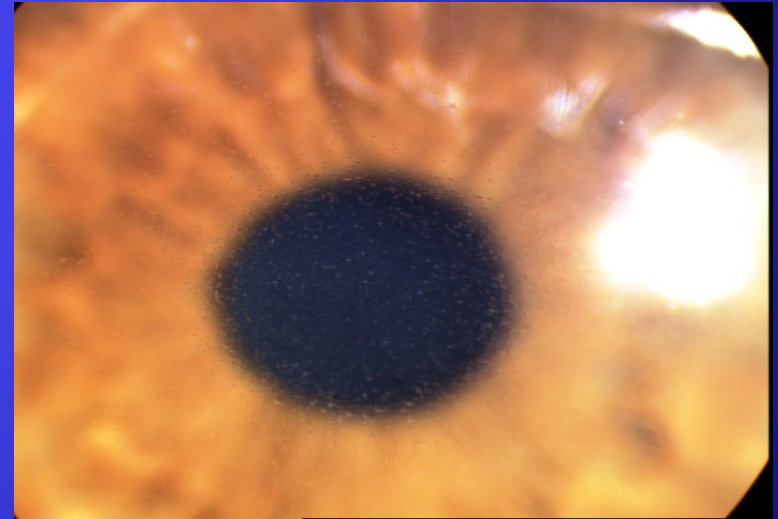


Lattice dystrophy



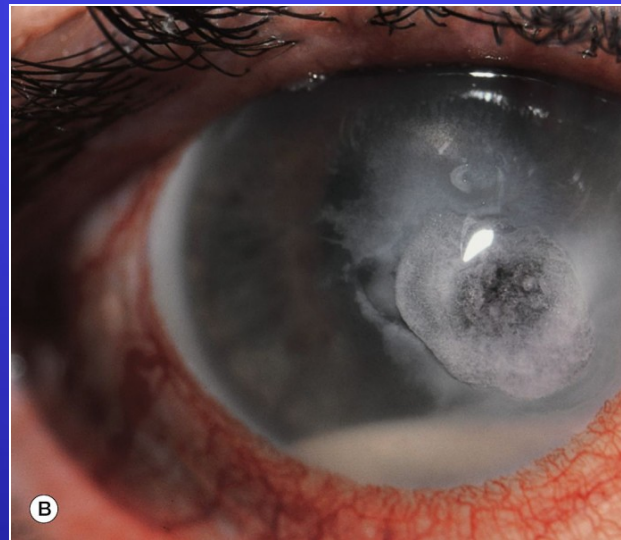
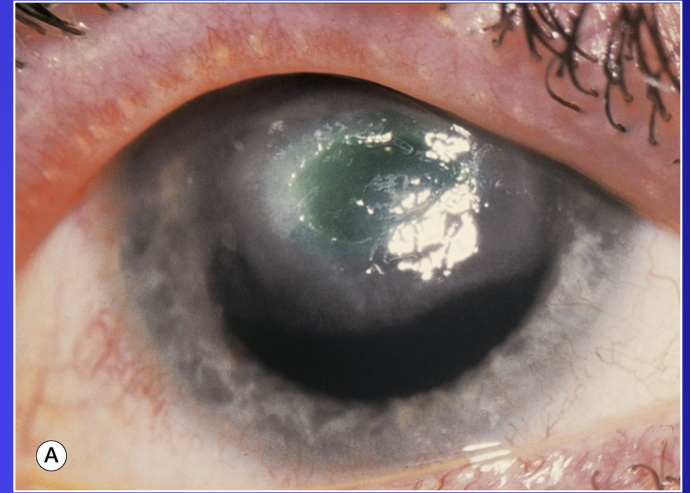
Fuchs endothelial dystrophy

- Bilateral, accelerated corneal endothelium cell loss
- Irregular warts of excrescences of Descemet membrane secreted by abnormal endothelial cells
- Endothelial decompensation
- Stromal edema, blurred vision, epithelial edema



Corneal infection

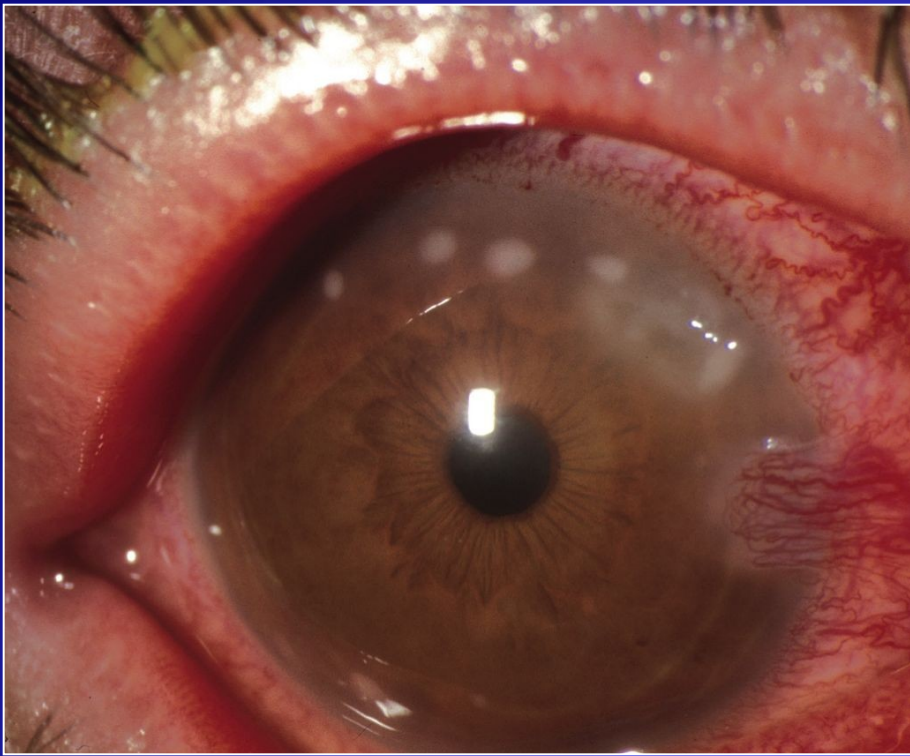
- bacterial
- viral
- fungal
- protozoan



Clinical features of bacterial keratitis

- Blurred vision
 - Photophobia
 - Pain
- Edema of the eyelids
 - Deep injection
 - Mucopurulent secretion
 - Corneal defects
(damaged epithelium,
stromal infiltration)
 - Hypopyon

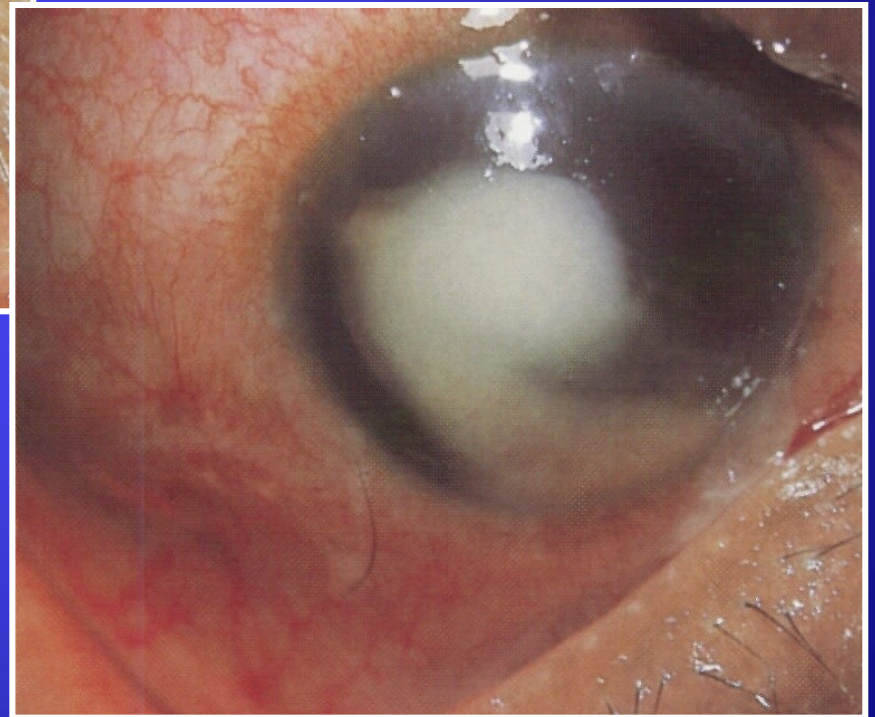
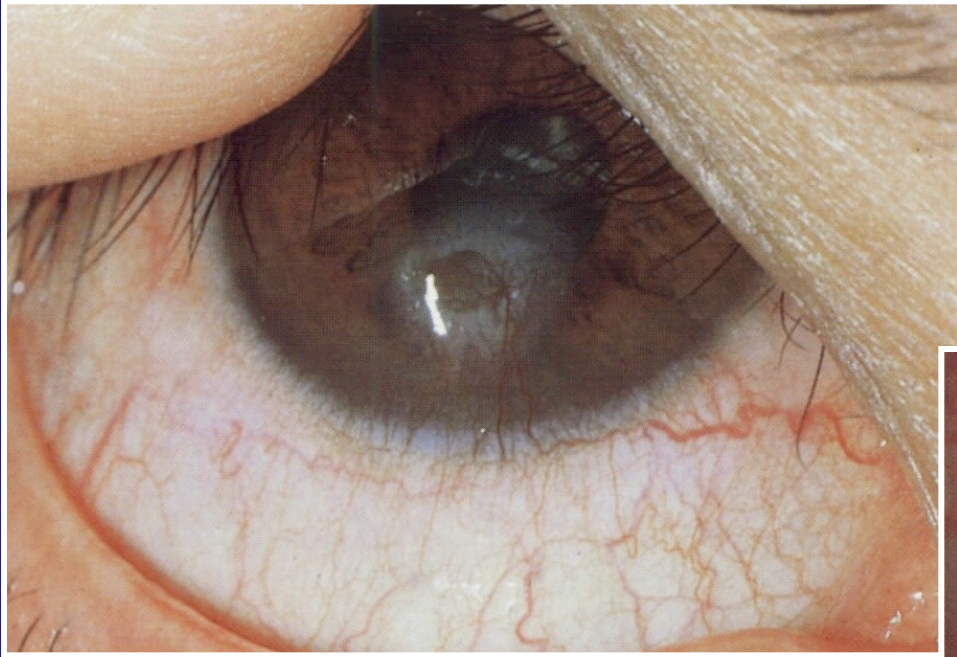




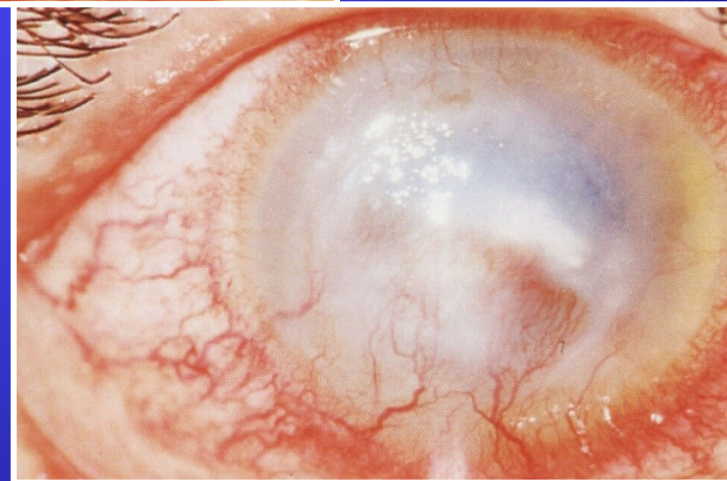
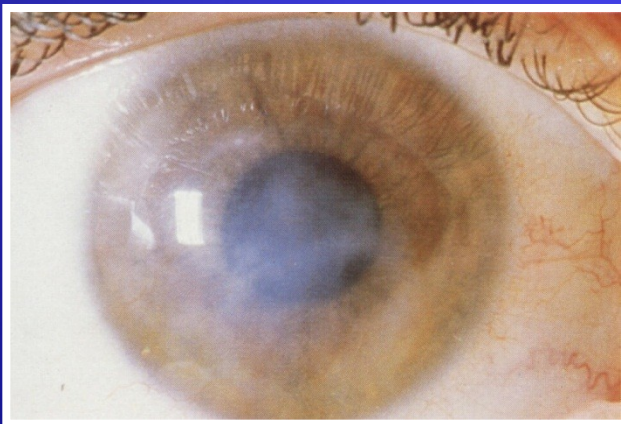
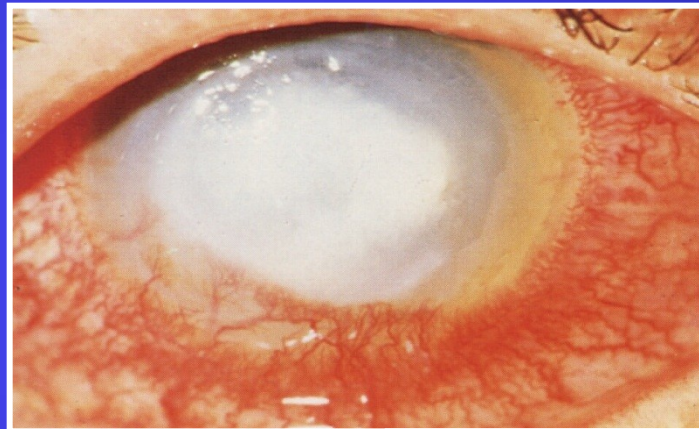
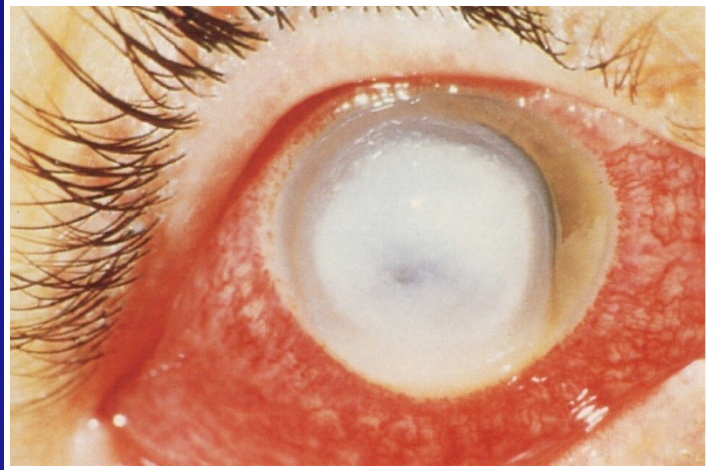
Staphylococcus aureus



Staphylococcus

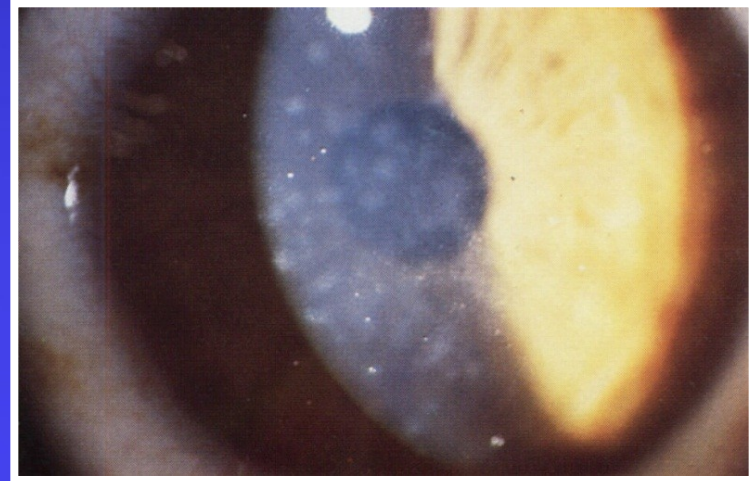


Pseudomonas Aeruginosa



Viral keratitis

- **Adenoviridae**
 - adenovirus (keratokonjunktivitis)
- **Herpesviridae**
- **Herpes simplex virus** (keratitis)
 - Varicella zoster virus (keratitida)
 - Epstein Barrové virus (keratitida)
- **Poxviridae**
 - Molluscum contagiosum (keratitis)

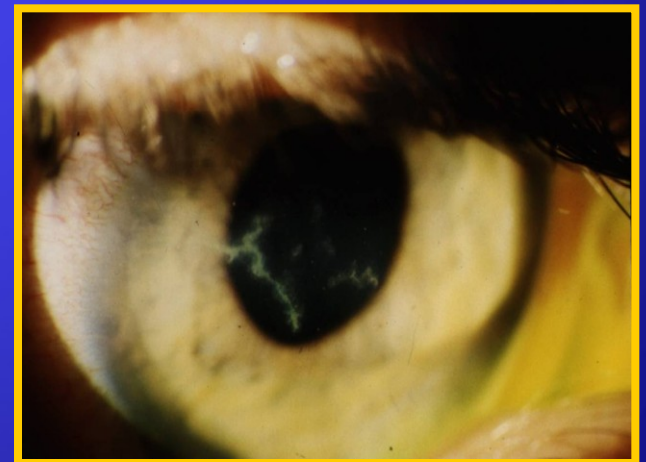
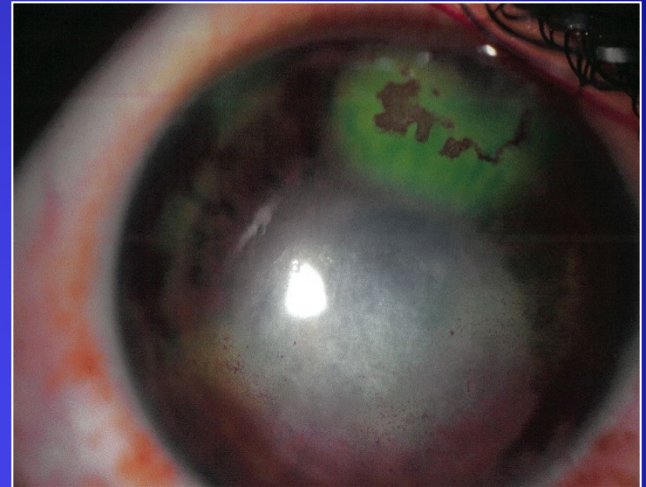


Viral keratitis

- Primary herpetic infection
- Keratoconjunctivitis
- corneal hypoesthesia

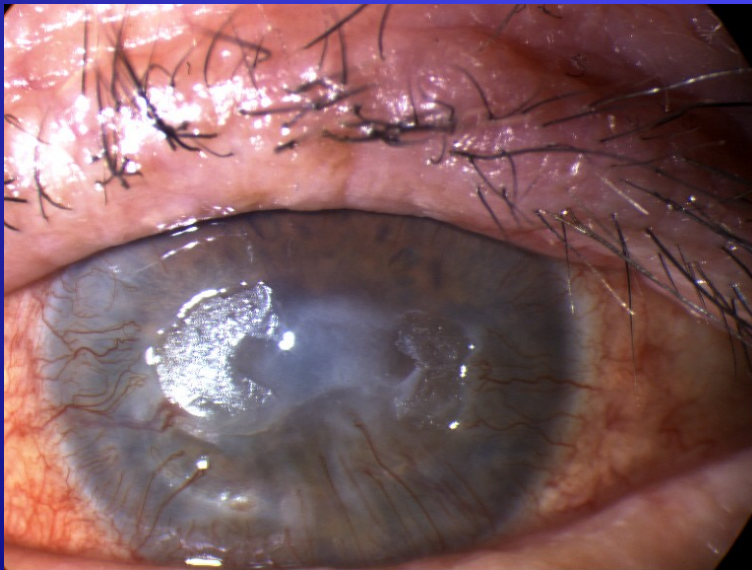
- Treatment:
Mydriatics, antiviral
agents, lubricants

CAVE steroids



Keratitis disciformis herpetica

- Hypersensitivity reaction to viral antigen in cornea
- Treatment:
Mydriatics, corticosteroids



Fungal keratitis

- Clinical features:

The white stromal infiltrate with indistinct margins

Wessly ring

Satellite lesions

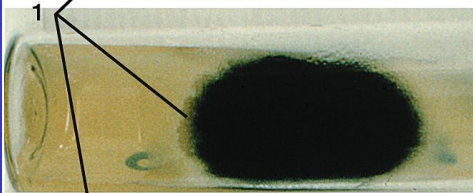
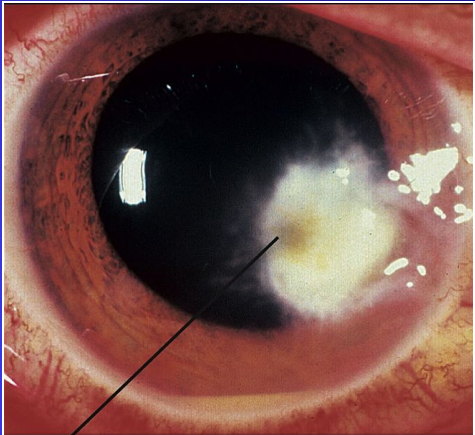
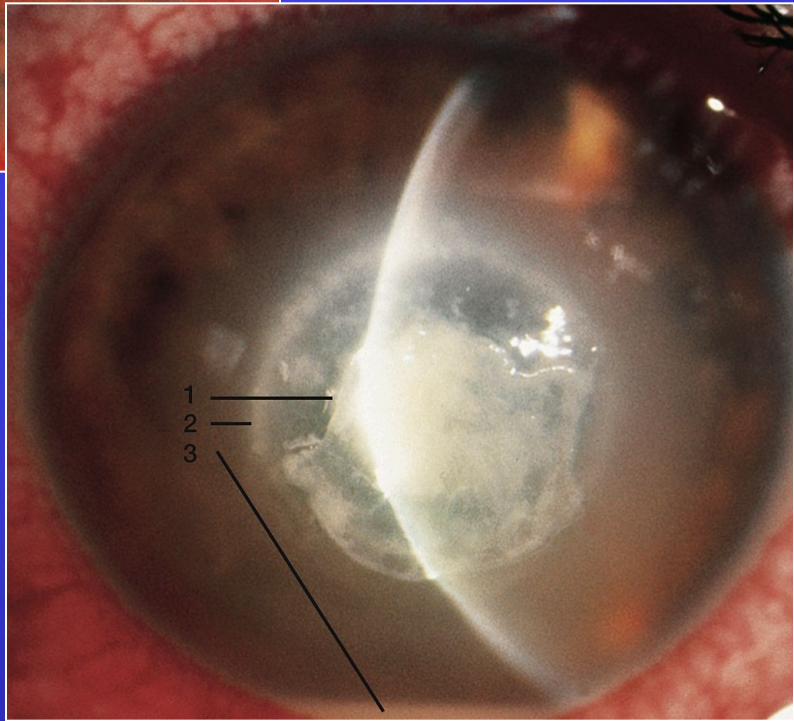
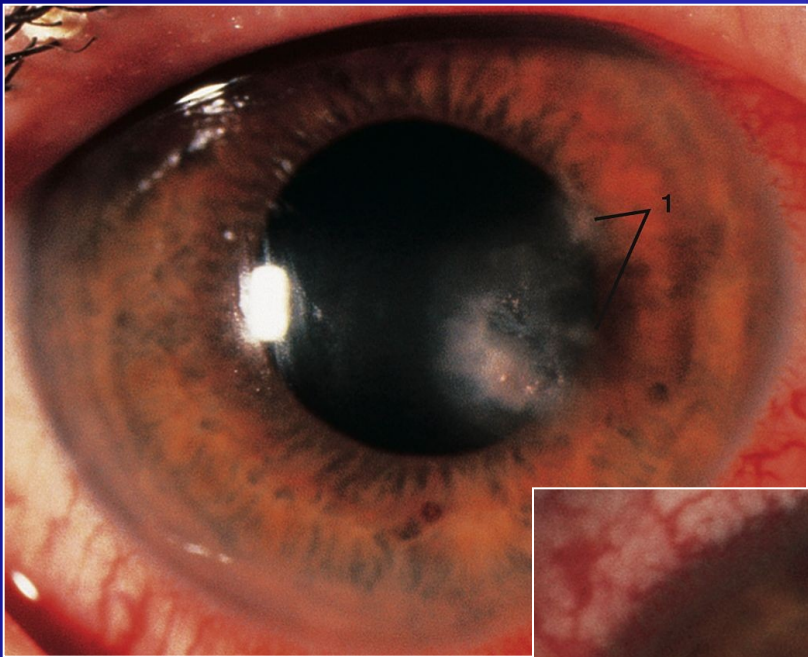
Hyphy in the corneal stroma and anterior chamber

Hypopyon

Dg: Cytological examination
cultivation - corneal scarification,
DNA diagnostics

T: removal of the epithelium
topical treatment
systemic anti fungals
(intraconazole)

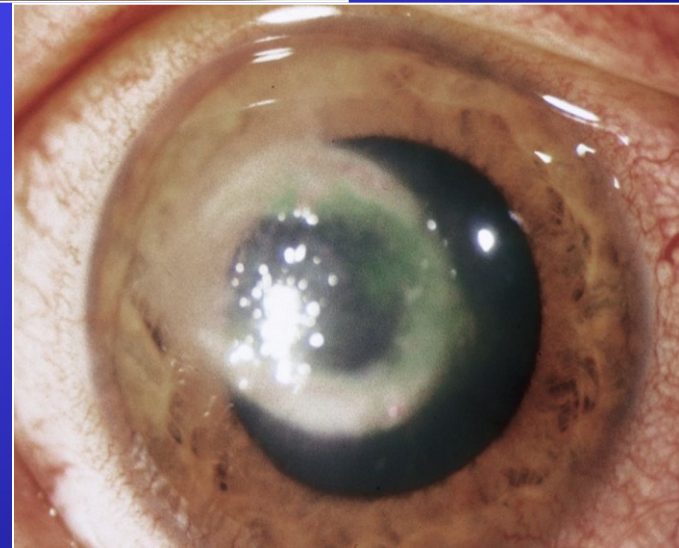
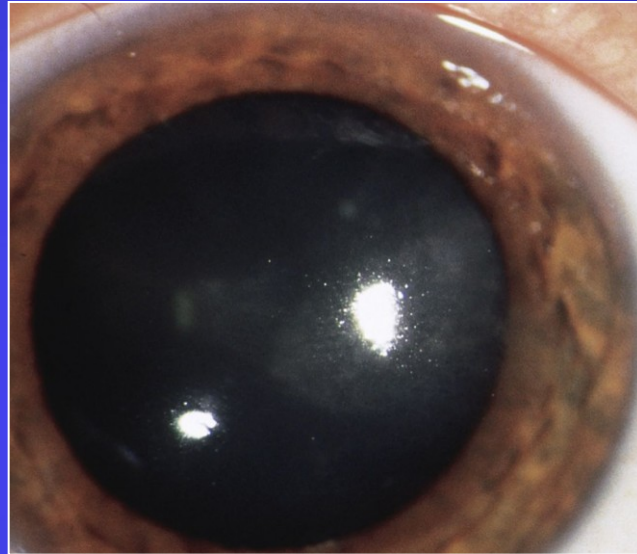




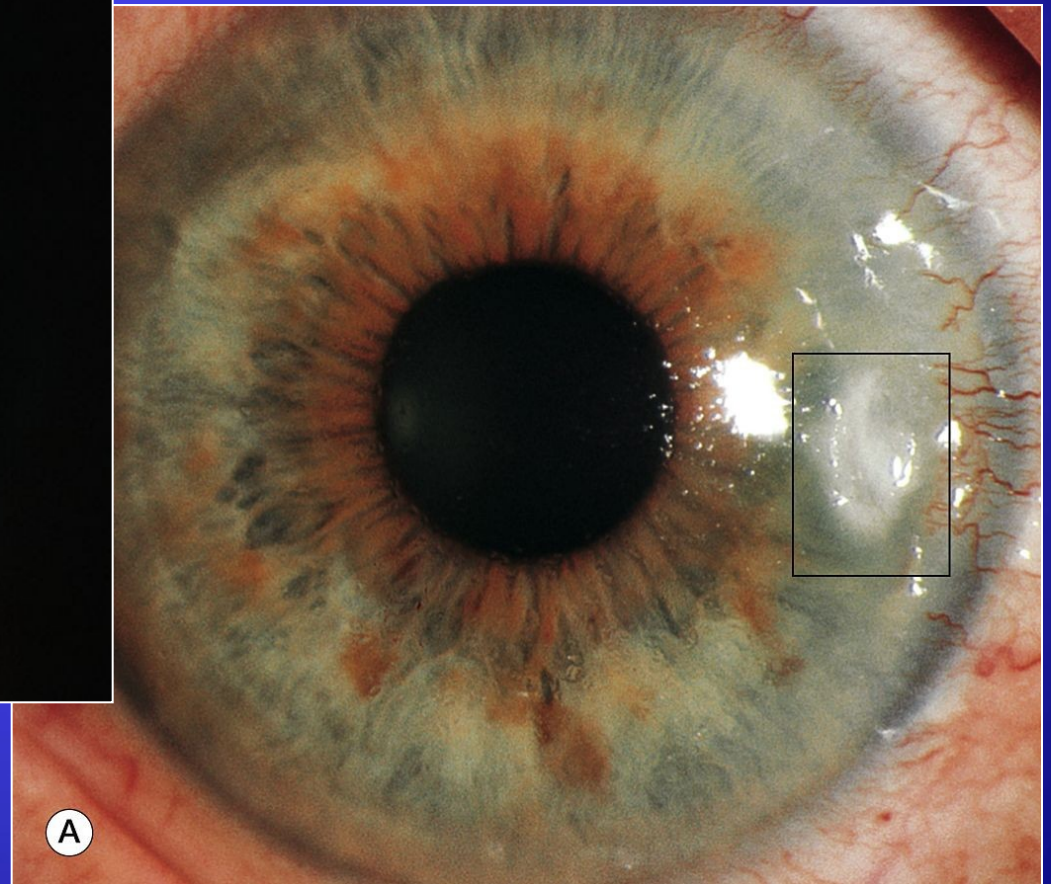
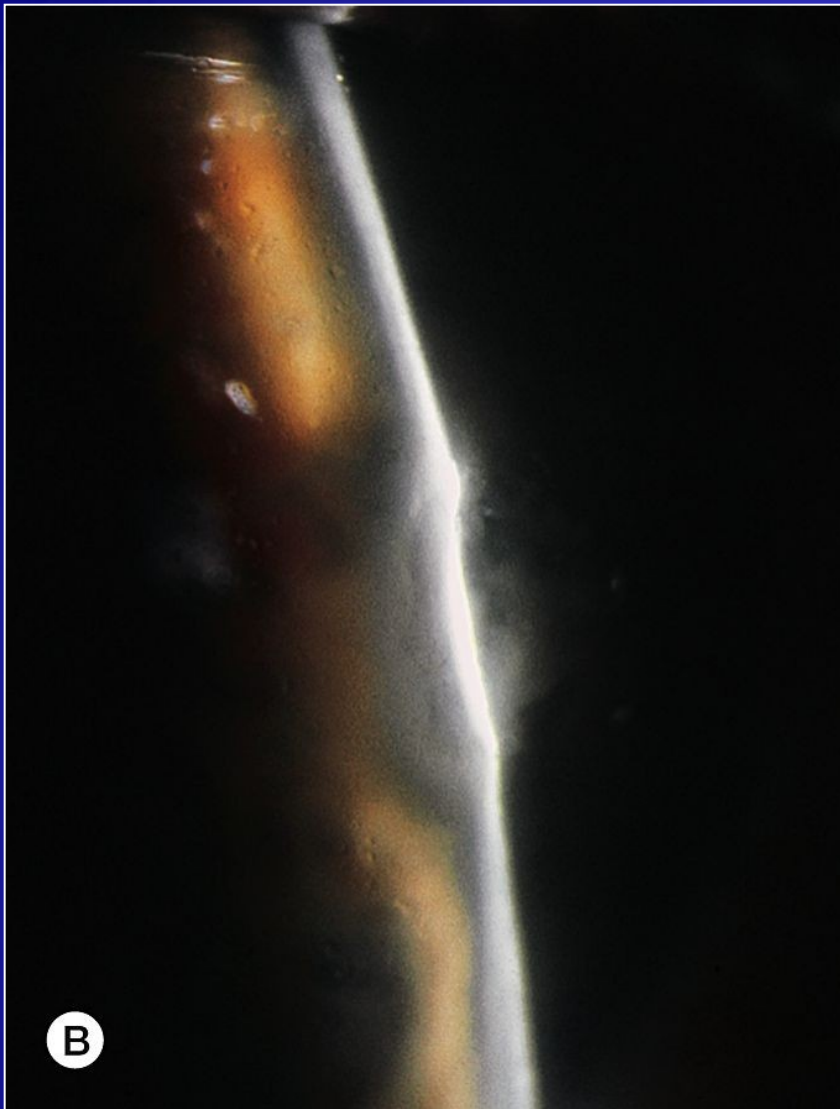
**Fungal keratitis
(Candida)**

Protozoan keratitis - Acanthamoeba

- Associated with contact lens wear (microerosion)
- Blurred vision, **pain !!**
- T: promanidin (Brolen), Polyhexamethylenm chlorhexidin



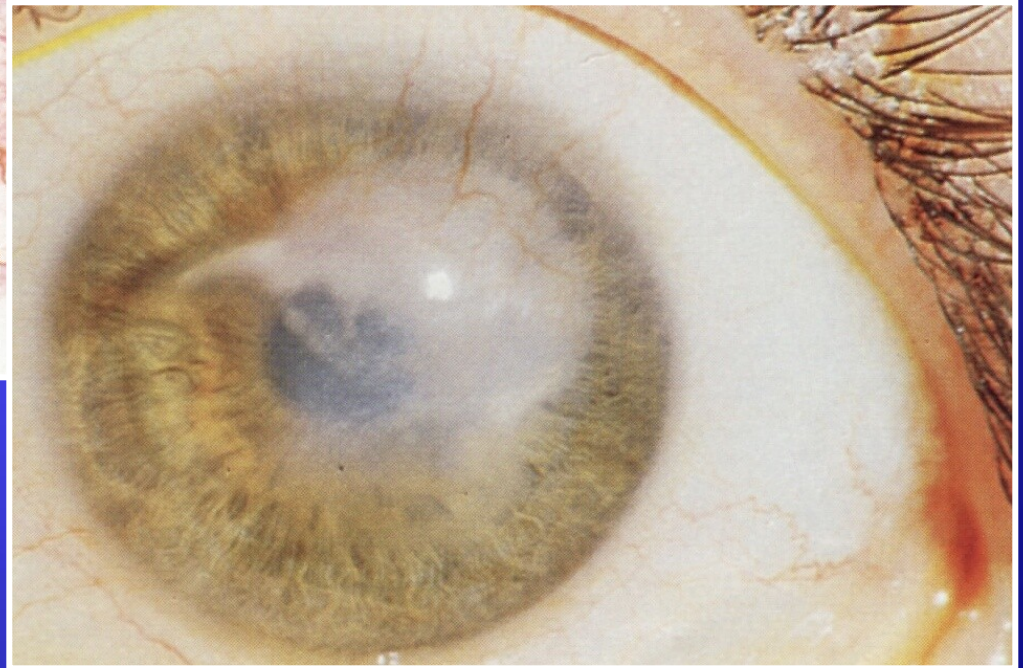
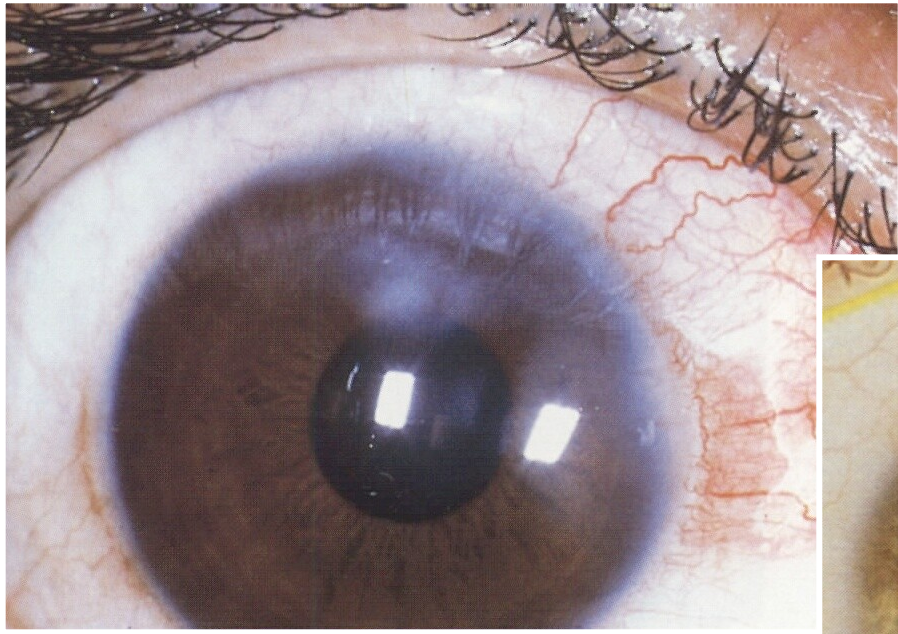
Ulcus corneae



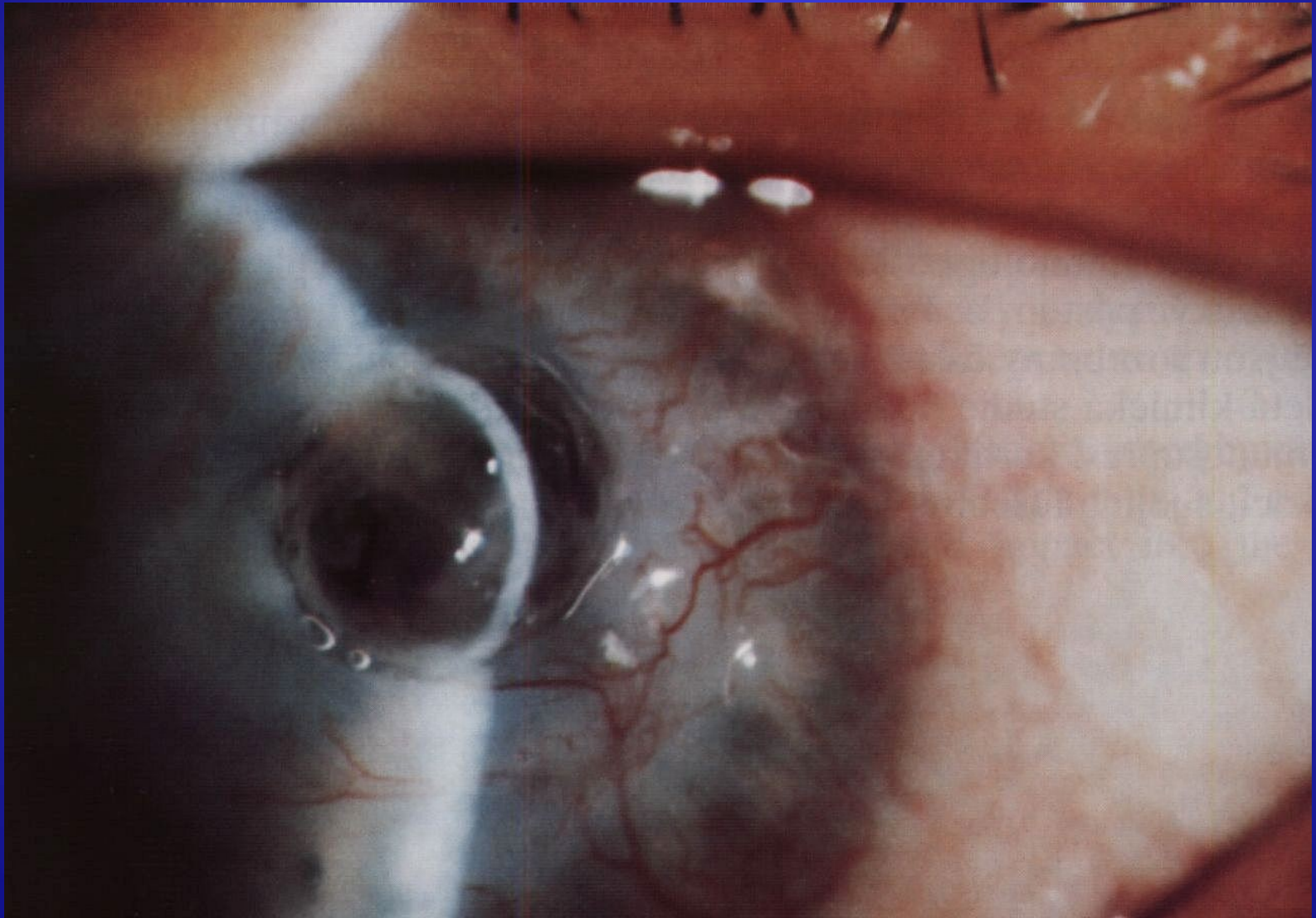
Keratitis interstitialis

- **Interstitial keratitis** - on the basis of the immune response to live microbe - antigen in the cornea (syphilis, tuberculosis, herpes, monokukleóza, fymfognulom, Lyme disease, rubella, leprosy, mumps, etc.).
- **Mooren's ulcer** – III.type of hypersensitivity,
- **Exposure keratitis** – due to paresis n. facialis
- **Peripheral ulcerative keratitis (PUK)** - infectious involvement in systemic diseases (rheumatoid arthritis, lupus, scleroderma, polyarteritis, arcoidosis...
- **Neurotrophic keratitis** – loss of corneal innervation of n. trigeminus (trauma, tumors, RS, cerebrovascular lesions)
- **Always stromal infiltration with scarring and neovascularization**

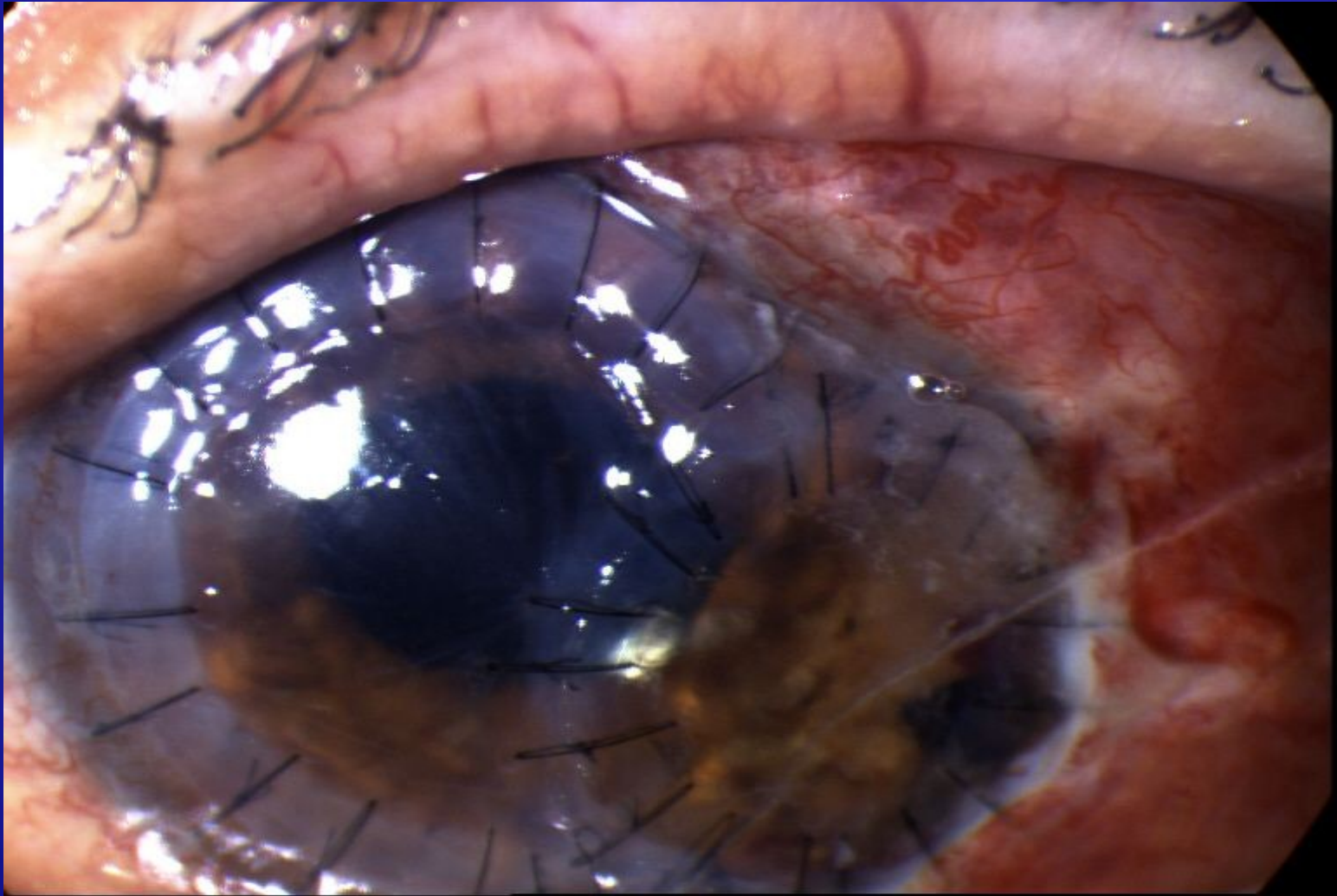
Keratitis interstitialis



Neurotrophic keratitis - Descemetocelata



Keratitis neurotrophica

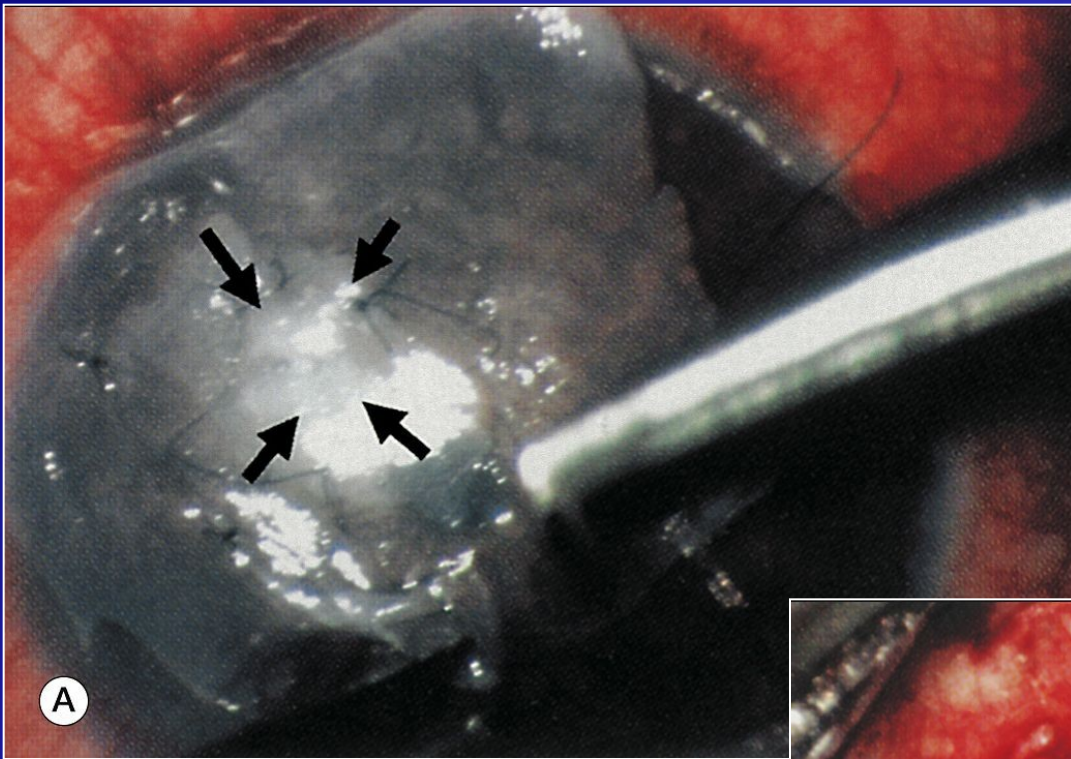


Surgery treatment

- Transplantation of amniotic membrane
- Transplantation of conjunctiva partial
- Lamellar transplantation
- Perforating keratoplasty
- DMEK
- Keratoprotheses (osteo – odonto)
- Artificial cornea
- Phototherapeutic keratectomy (PTK)

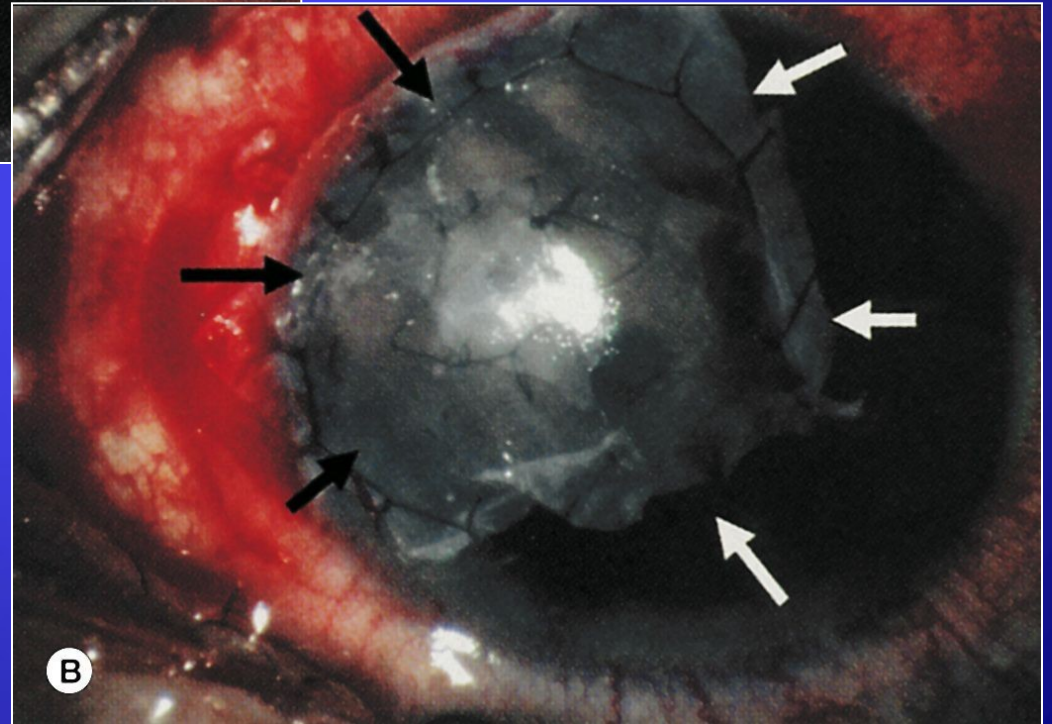


FIGURE 3 Modified Osteo-odonto-keratoprosthesis one year after implantation. (Photo courtesy of Victor Perez, MD.)

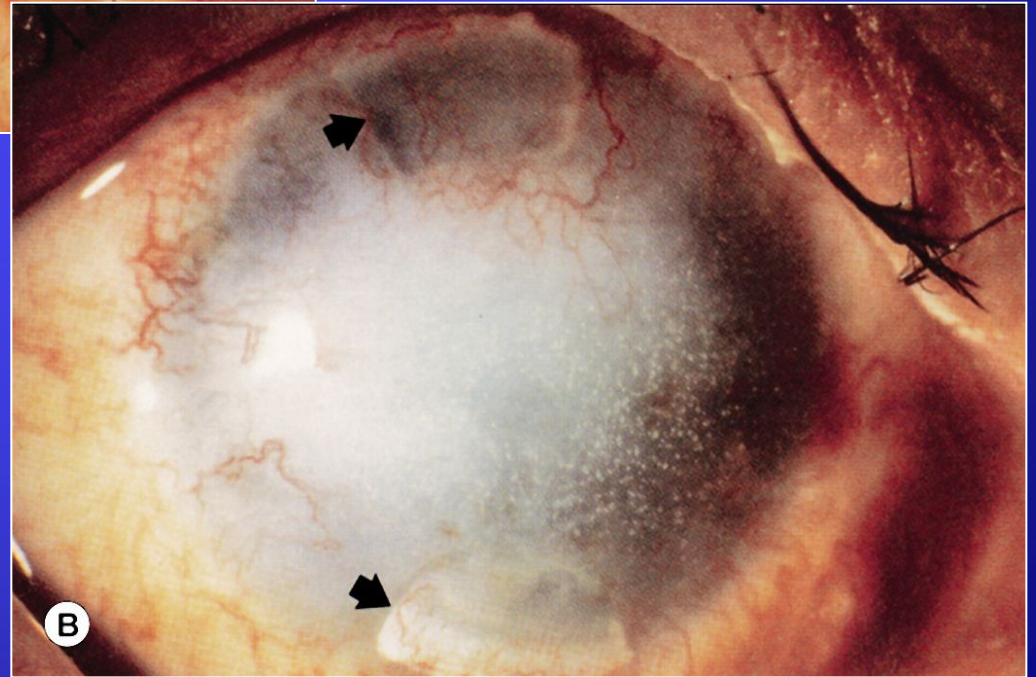


A

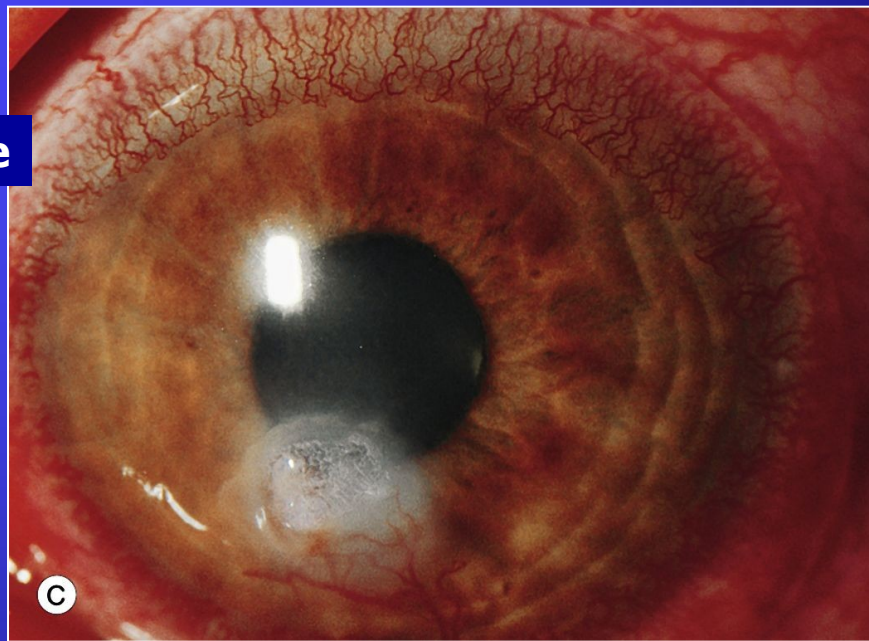
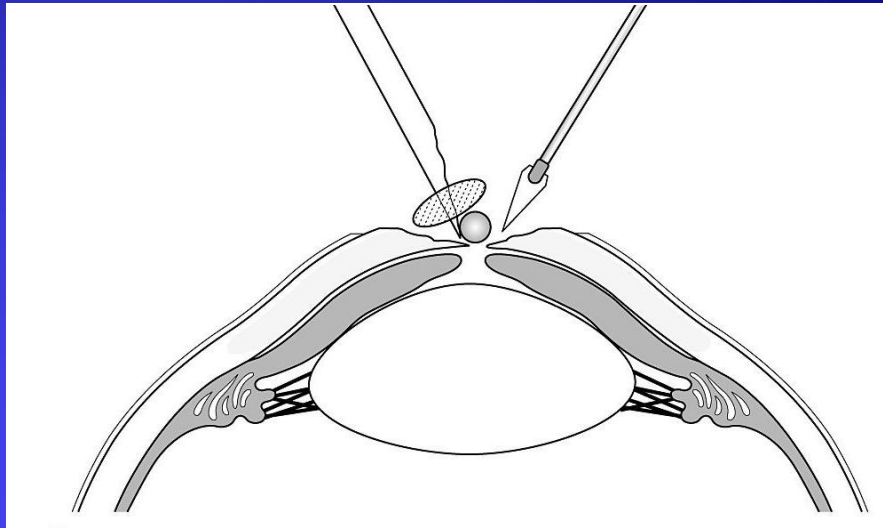
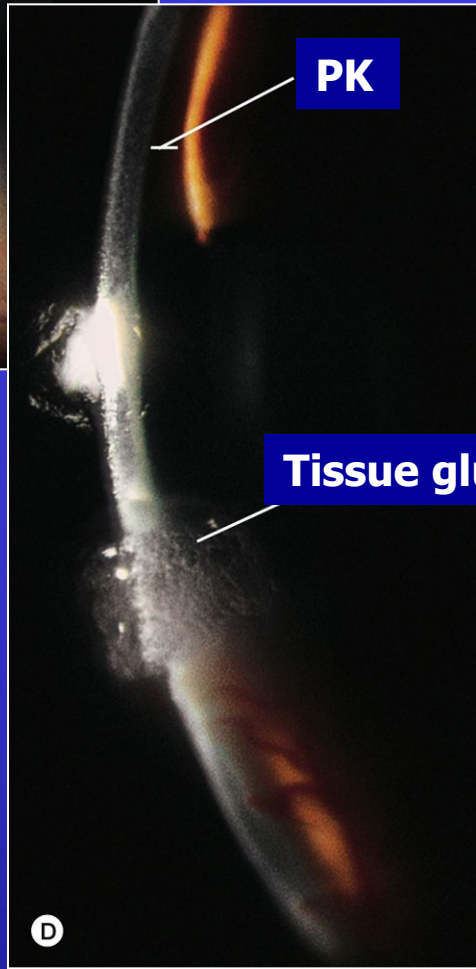
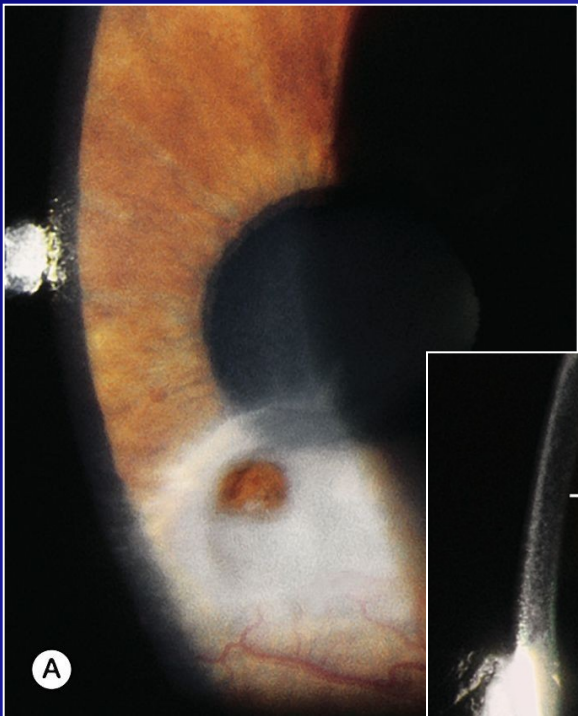
Amniotic membrane



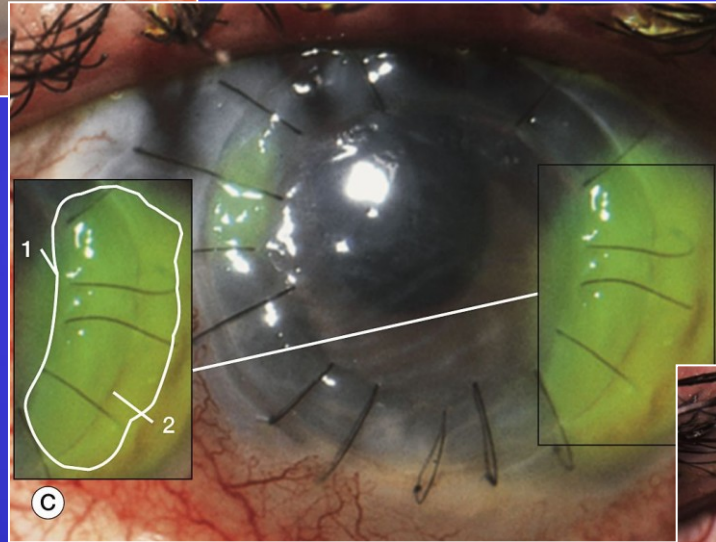
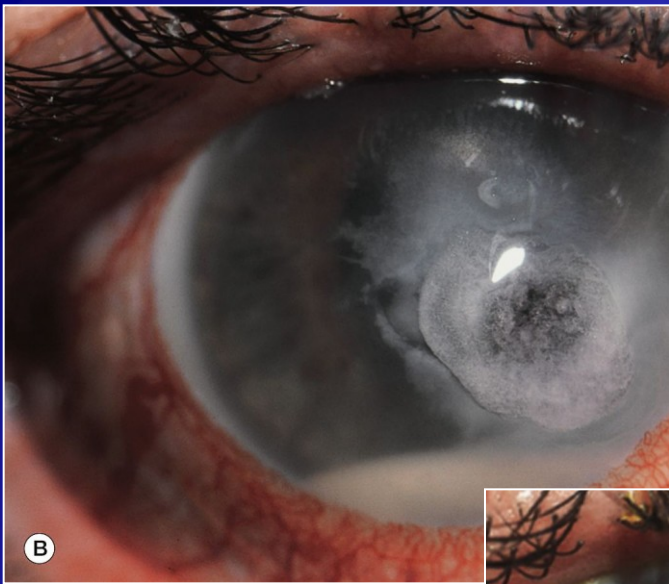
B



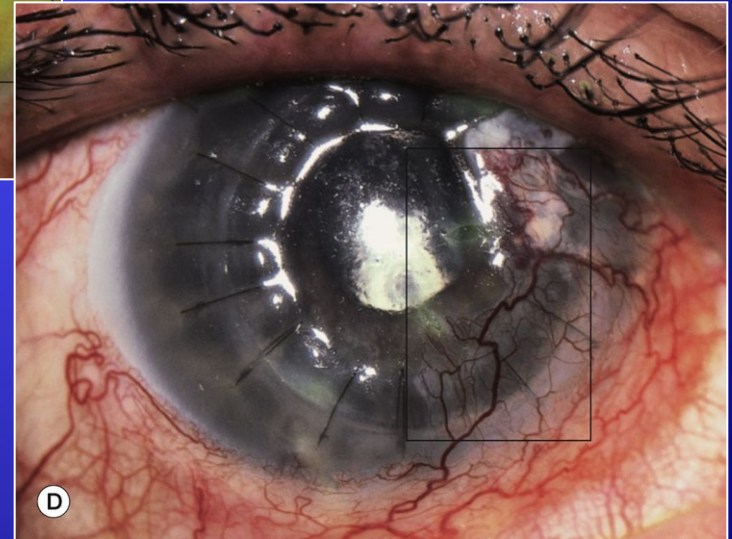
Conjunctiva transplantation



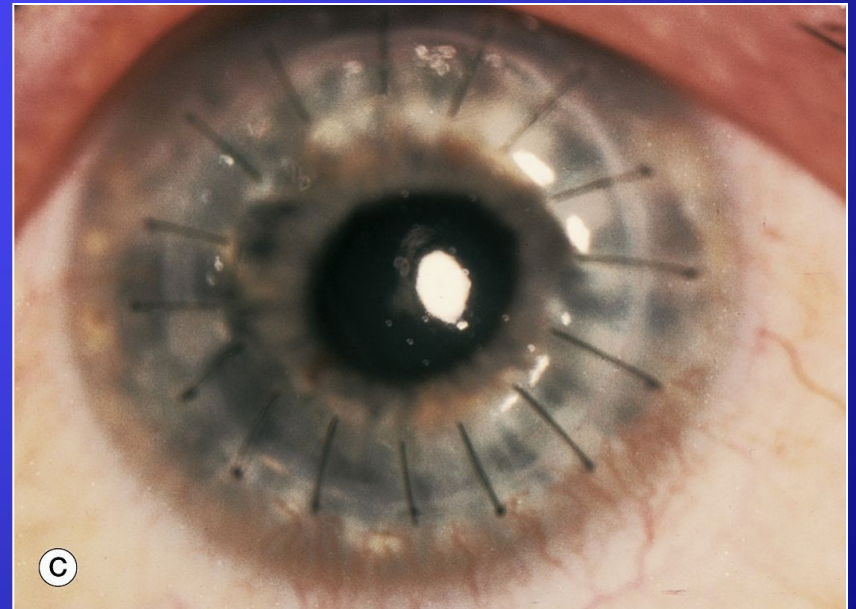
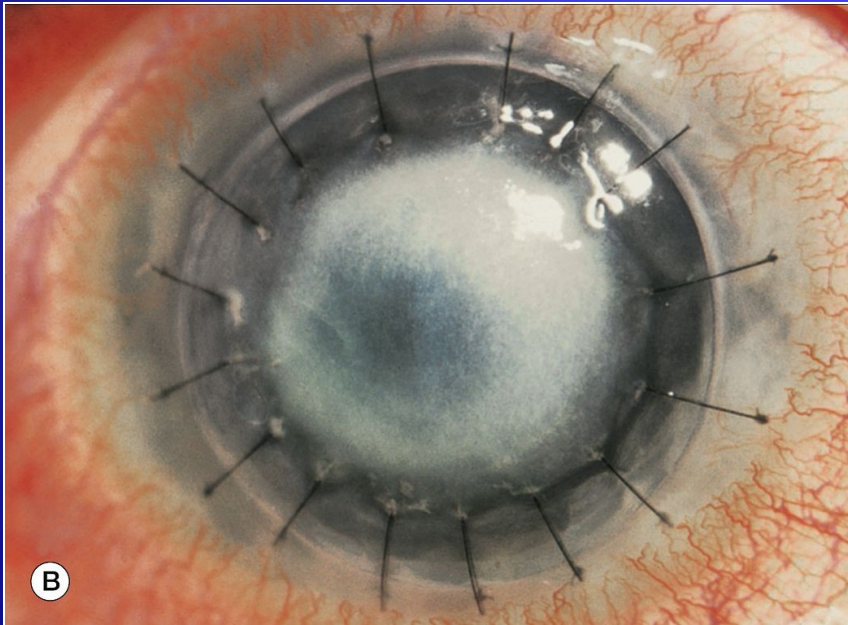
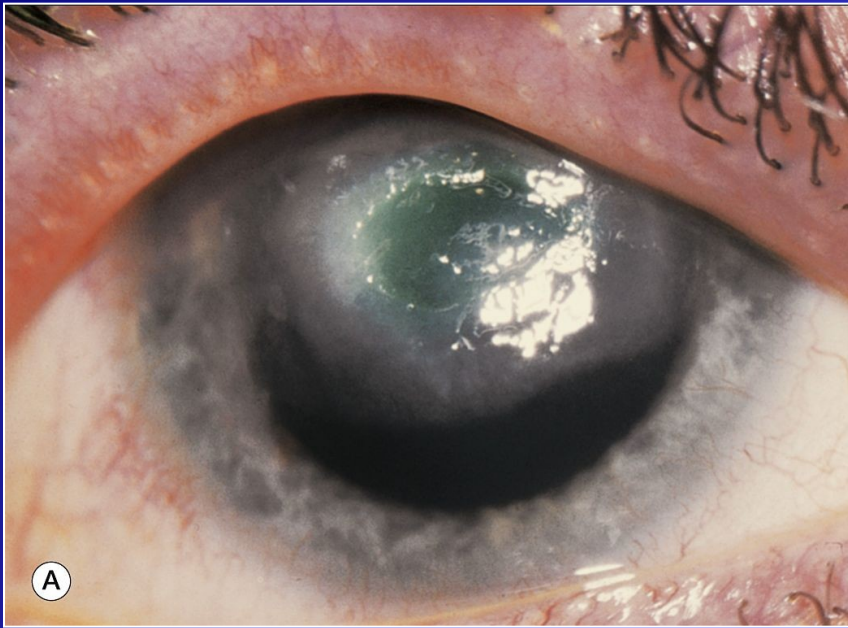
Penetrating keratoplasty

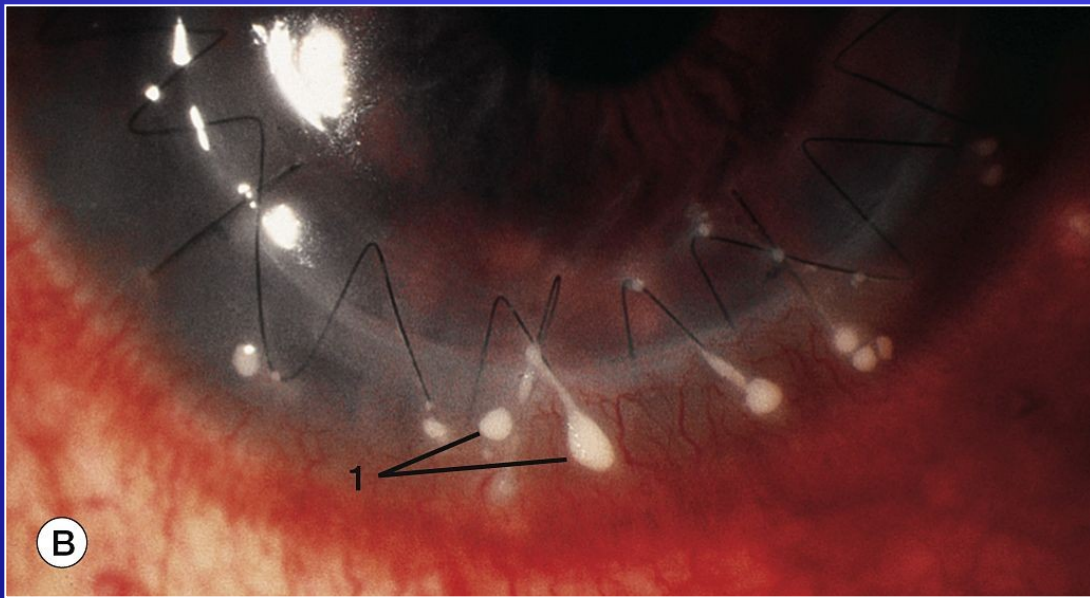
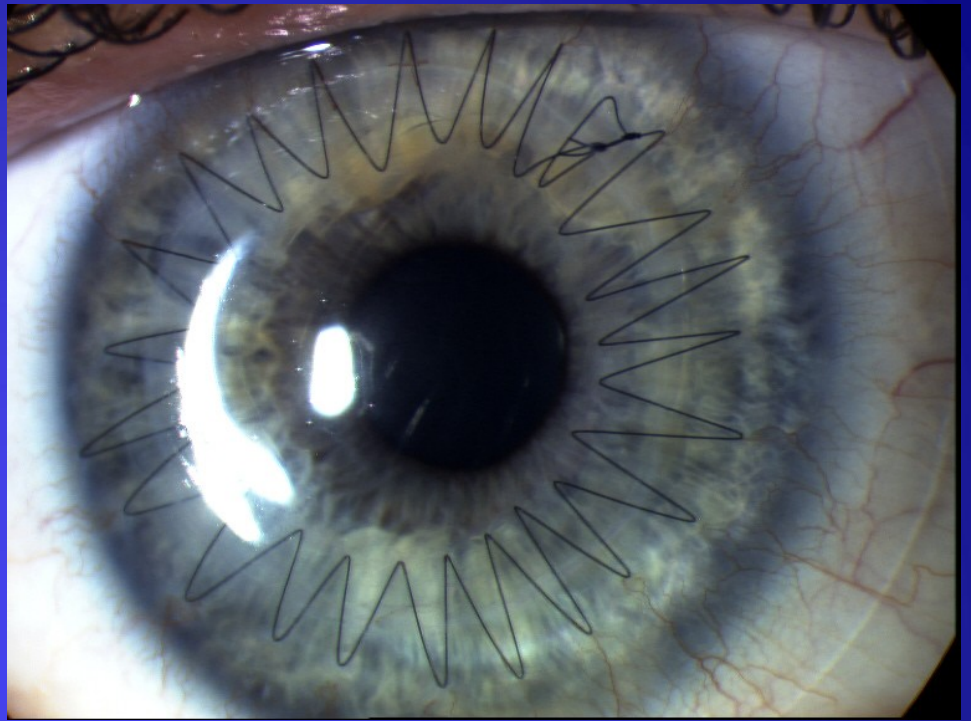
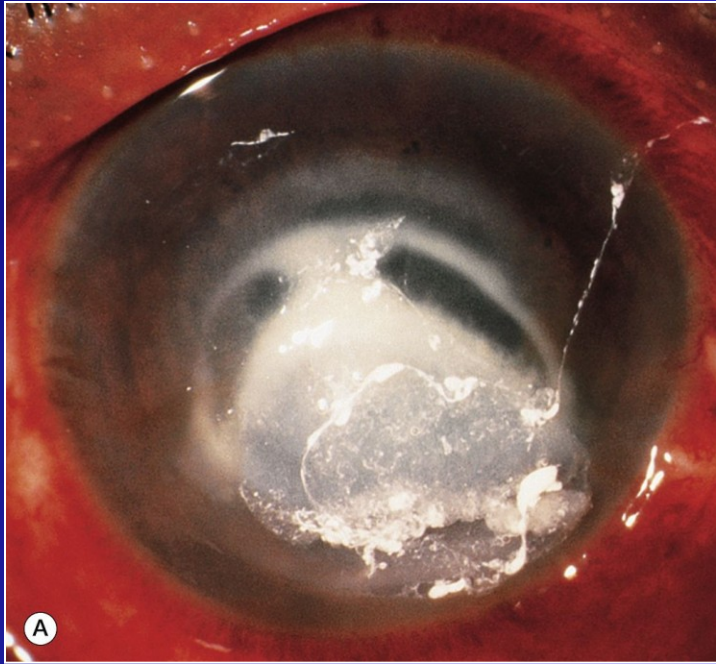


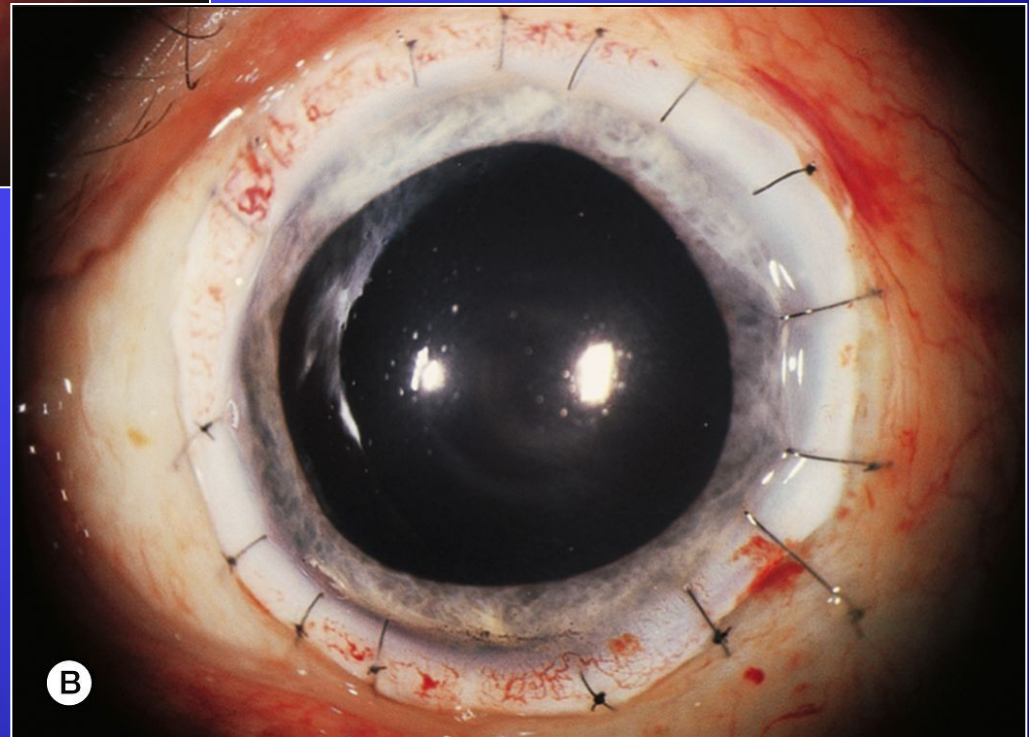
Viral keratitis



Fungal keratitis

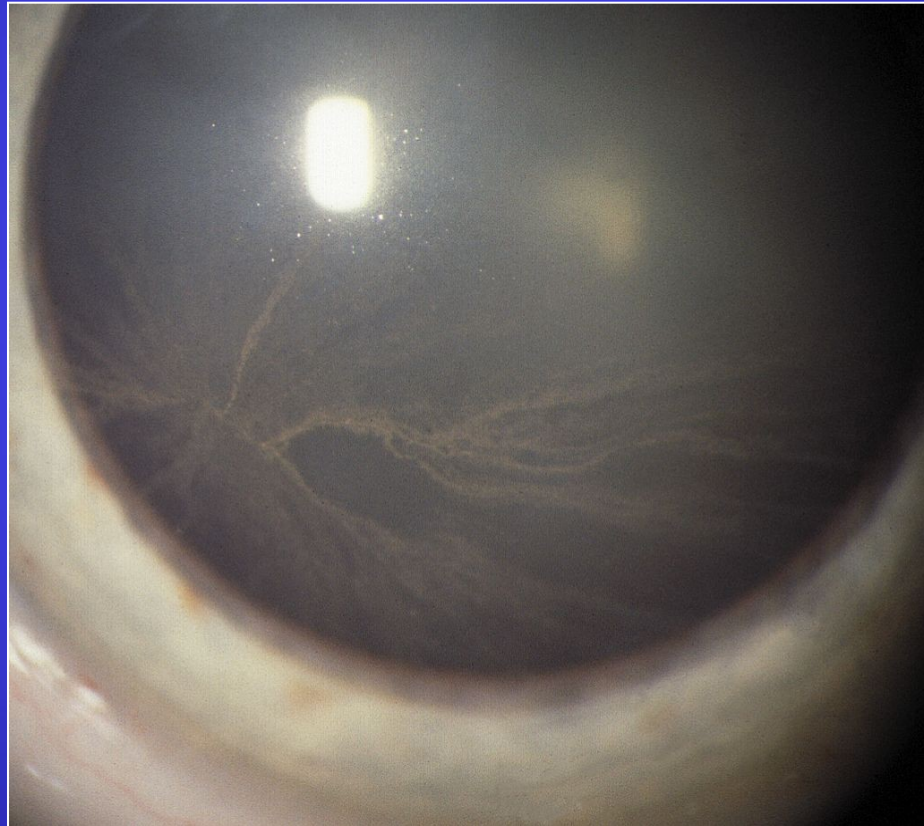






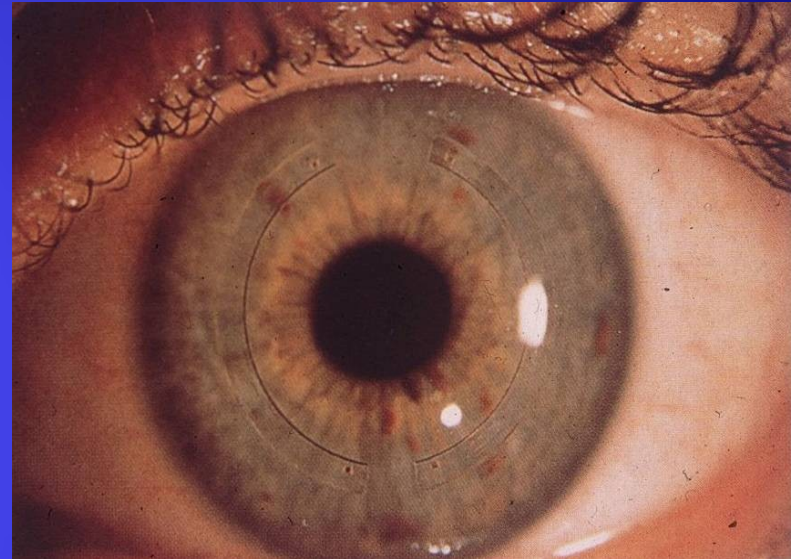
**Bacterial
sklerokeratitis**

Cornea verticillata



Refractive surgery

- Keratotomy - radial, hexagonal, arkuátní
- Intrastromal rings - myopia, astigmatism
- Intracorneal lens
- PRK - photorefractive keratctomy, LASEK
Epi-LASIK
LASIK - laser in situ keratomileusis



Photoablation - argon-fluoride laser
Femtosecond laser – intrastromal



Děkuji za pozornost